Nature Magazine

VOLUME 33 NUMBER 8

OCTOBER 1940

35 CENTS

Pep Up Your Meetings

Motion pictures of Nature and the Outdoors will take you far and wide in the world of the wild.

Schools; Garden Clubs; Women's Clubs; Nature and Hiking Clubs; Boy and Girl Scout Troops; Church, Civic and Fraternal Organizations; Sportsman and Conservation Groups will be interested in these motion picture films. Thrilling, educational motion pictures help to boost attendance at meetings. They make meetings more interesting and help to promote some educational activities by increasing a knowledge of Nature and the outdoors; developing a consciousness of the need for practical conservation of our national resources and the protection of wildlife.

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These interesting, entertaining and educational films are grouped as follows:

GROUP I: Specially adapted for school use and for juvenile audiences.

11. *Babes in the Woods:* The life of Nature's young in the wild.
12. *Wild Animal Pets:* A naturalist's dog into whose life came many strange animals.
13. *Renting Houses for Songs:* An intimate study of bird life.

GROUP II: A spectacular series of Alaskan reels.

21. *Cruising North:* Murres, sea puffins, bear and other coastal wildlife.
22. *Off to Glacier Bay:* Spectacular pictures of the face of a glacier breaking off and plunging into the bay. Also wildlife scenes.
23. *Wild Animal Outposts:* Hardy Island deer, ptarmigan, bear cubs, blue fox, fur seals of the Pribilofs.
24. *Thar She Blows:* Whales at sea.
25. *Great Bear of Alaska:* Films of the great Kodiak bears of Admiralty Island.

GROUP III: Southwestern series.

31. *Wings to the South:* Bird life of the Texas Gulf coast and the southwest.
32. *Riding the Rimrock:* Searching the rough country of the southwest for its wildlife.
33. *Nature's Side Show:* The struggle for existence in the arid southwest.
34. *Queer Creatures of the Cactus Country:* A study in the adaptation of wildlife to a harsh land.
35. *Getting Personal with Mountain Lions.* A thrilling picture of a pack trip into lion country.

GROUP IV: Photographed along the Continental Divide.

41. *The Big Game Parade:* You meet Antelope, Mountain Sheep, Mule Deer, Elk, Bison, Moose, Brown Bears and Grizzlies.
42. *The Forests:* Forest Fires, Birds, Beaver—greatest conservationist of all—at work.
43. *When Mountains Call:* The life of the high places is thrilling to see. Water Ouzel, Ptarmigan, American Eagle, Big Horn Sheep, Wapiti—American cousin of the European Stag.
44. *Ramparts of the North:* Filming big game requires endurance. Glaciers, Hoary Marmot, Caribou, Moose, Black Bear.
45. *Getting Our Goat:* Mountain Goat on its native crags. Ground Squirrels, Cony, Grouse.

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Camera Trails

BY NORRIS W. HARKNESS

REDWING BLACKBIRD AT ITS NEST
Prize photograph by Adrian C. Fox, Mandan, N. D.

Camera Trails

"What camera shall I buy?" This is a question that comes to every advanced worker in photography time after time, and the man who asks it is rarely satisfied with the answer. There is no one camera that fulfills every need, and the camera that is best for close-up shots of flowers and insects will not be fast enough in action for pictures of birds on the wing, or animals encountered suddenly in the woods. Furthermore, some cameras have an exceptionally wide versatility at the sacrifice of portability.

So to that question, I can only answer with a whole series of other questions. Without attempting to list them in the order of their importance—which naturally will vary from person to person—I need to know how much you wish to pay for your outfit, what kinds of pictures you wish to make, your ultimate use for the pictures themselves, and the degree of your willingness to carry accessories and equipment.

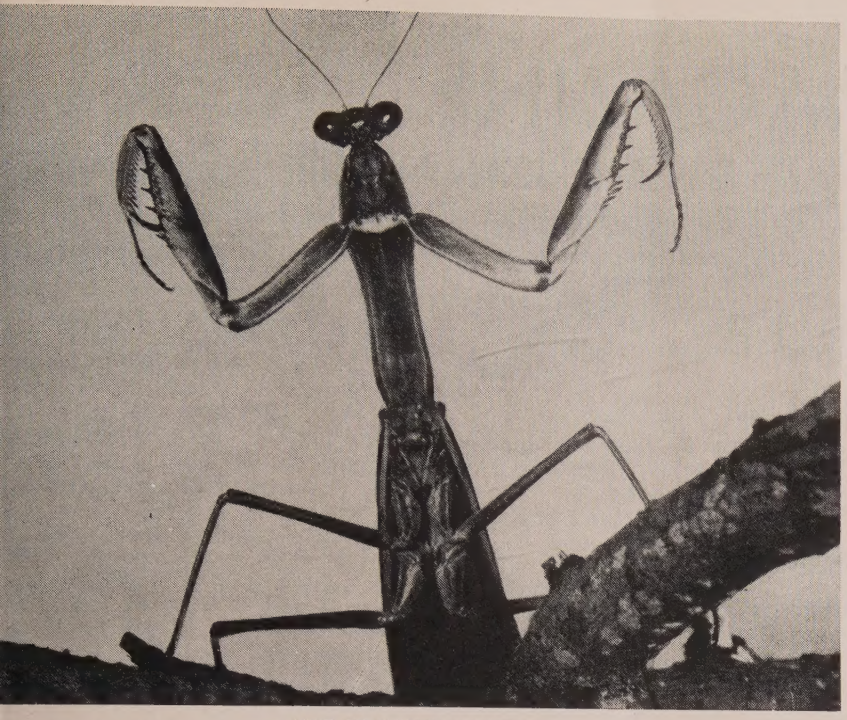
There is still another thing that we must consider in picking your camera for you, and that is your skill as a laboratory technician and your ability and willingness to do the type of developing and printing that the various negative sizes require. This is important, for while the more expensive 35 mm. cameras, like the Contax, Leica, or Exakta, with their wide variety of interchangeable lenses are undoubtedly the most versatile machines we have, their negative size is so small that everything in the process must be done perfectly if we are to get pictures of good quality. The exposure, the steadiness of the camera, the development and printing must all be done to an exceedingly high standard with these tiny negatives, and, of course, there is small opportunity for retouching or negative manipulation.

However, the quality of the picture that can be made with these cameras by the photographer who is willing to attain the perfect technique they demand is on a par with that of any other camera. The fact does remain, though, that the operator of the small camera must be more efficient than one who may use a larger machine. So, with the realization that the 35 mm. camera can do just about anything if you are skillful enough, let's go on and consider the larger negative sizes and the camera types best fitted for various pictures. If the element of time in setting up the camera and getting ready for the exposure is unimportant, as in the case of pictures of flowers, extremely close up shots of insects that cannot get away, or for trap shots in which the camera is left in position and fired from a distance or with a trigger by the subject itself, a camera with a ground-glass back is excellent. It may be 2¼ x 3¼, or larger, and will probably have an f/4.5 lens. This is fast enough for anything except the worst lighting conditions, and the fact that the picture may be focused and composed on the ground-glass is helpful. Then, too, many of these cameras may be equipped with wide-angle or telephoto lenses to increase the possible range of their usefulness.

Retaining many of the advantages of this film-pack camera, with the addition of greater speed in getting into action, is the reflex camera like the Graflex or the Korelle, both of which have focal plane shutters, can be fitted with extra lenses, and utilize a mirror inside the camera for focusing and composition. The Graflex is obtainable in several negative sizes, while the Korelle makes a 2¼ x 2¼ picture on 120 roll film. Both of them are usable for a wide range of pictures and are quite self-contained.

Any of the cameras we have mentioned may be used with supplementary equipment for work at very short distances or for telephoto shots, and of course they may be used for any pictures at intermediate distances. For these pictures made at a working distance of from five to fifty feet these cameras have small advantage over the ordinary folding camera. There is, of course, always the exception to this statement in case of those pictures that must be made at thirty or forty feet because the object cannot be more closely approached. In such instances it would be better to use a telephoto lens to get a larger image on the negative. For ordinary shots at the intermediate distances the folding camera is quick to get into action and does excellent work. Undoubtedly the vast majority of Nature pictures have been made with just such equipment. The owner of such a camera should realize that his picture of a duck 200 feet away is likely to be somewhat less than satisfactory, and he must resort to a supplementary lens, and, perhaps, to the temporary ground-glass that I described in the columns in the December, 1939, issue for work at extremely short distances.

To sum this up and make it a little more definite, if the amount to be invested is of no moment and you are willing to put in the hours of hard work necessary to become a first-grade technician, the 35 mm. camera, with its auxiliary gadgets, should be investigated. For considerably less cost and just as wide a range of subjects but with some loss in portability there is the view camera, or the film-pack camera equipped to take telephoto lenses. This is still a not-inexpensive outfit, but it puts less premium



THE PRAYING MANTIS
Prize photograph by Dr. William H. Bard, Scarsdale, N. Y.

your excellence as a laboratory technician. The simpler cameras that cannot be fitted th telephoto lenses and cannot be focused thout a supplementary lens at very short stances cover the price range from a dollar . They are the most readily carried out-, are as fast in getting into action as any l are suitable—with the necessary adapta-n—to almost any kind of work except those tures that really need a telephoto lens.

All this is very general and does not give flat-footed answer to your question, but haps by now you realize that no one can swer this question for you with any real thority. The decision involves considera-n of so many factors that are scarcely own even to the prospective camera pur-ser that only he can determine what ma-ne he really wants.

The best advice I can give is this: Con-er carefully your need for a telephoto s and check on the cost of both the camera l the lens you feel you need, then con-er the other kinds of pictures you wish make; finally go to your dealer, or write catalogs, and weigh each factor against others. Then—and most important of —become so familiar with your new chine and how it works that it is almost t of you. If you follow that line, you'll good pictures whether your camera is lly perfect for the job or not.

The Contest

The exceptionally large number of entries the October contest, and the uniformly h standard of print quality, made the rk of the judges specially difficult. It s with the feeling that twenty or more the pictures could have received any ge's vote that they picked as this month's nners "Praying Mantis," by Dr. William Bard, of Scarsdale, N. Y., and "Redwing ckbird at Its Nest," by Adrian C. Fox, Mandan, North Dakota. Mr. Fox's picture specially noteworthy because of the fact that, although circumstances forced him to work at a distance of several feet and his picture is a small contact print, the quality of the picture and the interesting way in which both the bird and its nest have been handled would not permit its exclusion from the winning list.

The names of the runners-up are fast becoming familiar to readers of Camera Trails —F. Kirkbride of Los Angeles and Hugh M. Halliday of Toronto. My own curiosity is aroused as to the method by which the two pictures were made. Mr. Kirkbride has a shot of seven California valley quail, and Mr. Halliday has an excellent picture of a woodchuck. Both shots appear to have been made from a comparatively short distance and I would like to know—being curious about such things—whether the victims were "snuck up on" or taken by some remote-control method. Whatever the method, I congratulate the makers of all four of these excellent pictures.

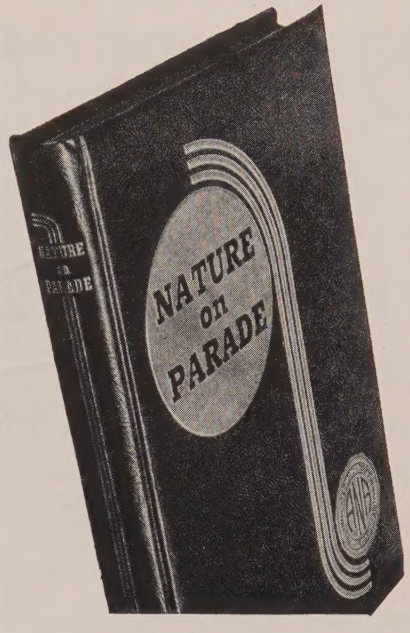
Remember that you have just a few weeks in which to send in your entries in the 1940 Camera Trails Contest. The December issue will be the last contest issue. Remember, too, that no pictures can be entered in the contest unless they reach me at 333 East 43rd Street, New York, before October 15, and that I cannot undertake to return any photographs.

The winners of the grand prize will be announced in the January issue.

This and That

Movie-makers will be specially interested in two magazine cameras that have appeared during the summer. One, the Eastman Ciné Kodak 90, uses the double eight film in magazines that need no threading, you can stop the shots on that roll, remove it from the camera, and replace it with another type of film without the loss of a single frame. After the twenty-five feet have been run through the camera the first time the maga-

(Continued on page 485)



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To Stimulate Public Interest in Every Phase of Nature and the Out-Of-Doors, and Devoted to the Practical Conservation of the Great Natural Resources of America

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ON THE RECORD

Out of the tragedy of the Dust Bowl came great novel, a great motion picture and a reat lesson in conservation. Most recent roduct of this example of man's profligacy ith the tremendous gift of fertile soil merica gave to him are two albums of ictor records under the group title of "Dust owl Ballads." In each album are three ecords, ten-inch size, recorded by Woody uthrie, author of the ballads, who sings em and accompanies himself on the guitar. son of the Dust Bowl and a victim of vents there, Guthrie imparts to these ballads oth the feeling of the tragedy and the cour-ge of those who suffered by it. On two des of one of the records he tells, in ballad rm, the story of Tom Joad and "The rapes of Wrath". Others of the records raw upon experiences in the novel, while hers reflect the writer's own struggles. Vhile Guthrie has put all this in his own ords, in reality the inspiration came from e words and impromptu songs of the mi-rant workers themselves.

Accompanying the albums is a folder ritten by Woody Guthrie, and in which he escribes himself as the "Dustiest of the ust Bowlers". Certainly he has transferred e dust and depression into words and music, nd it is greatly to the credit of RCA Victor at they have preserved these in this form. hese ballads represent a period in our untry's history that, we trust, has taught s a lesson and laid the foundation of a ovement to conserve and restore the soil -our greatest and most fundamental natural esource.

We heartily commend to any one con-rned with America's future, these two sig-ificant albums of records. They are known "Dust Bowl Ballads", Volumes One and wo, P-27 and P-28, Records #26619 to 26624, inclusive.

●

Although to the ornithological world the nctual return of the swallows to the Mission San Juan Capistrano in California is re-rded somewhat as wishful thinking, the ory is a pretty one and duly recorded in e newspapers each year. Most recently it s provided inspiration for a beautiful pular song entitled "When the Swallows me Back to Capistrano", the work of on Rene. The song has climbed to a high sition in the public favor, and justifiably It has been recorded variously, one at-ctive record being Victor Bluebird B-10769-A, on which Dick Todd sings the ric in his rich baritone to the accompani-ent of orchestra and male trio.

●

Publication of the eleventh edition of *hat We Hear in Music,* by Anne Shaw ulkner, is announced by Ellsworth C. Dent, ucational director of RCA Victor. One of e leading reference books on musical sub-cts, this volume, through its numerous edi-ns, has been used as a text in junior and nior high schools and colleges. The latest ition is enlarged to 690 pages with a new dex. It sells for $2.25, and may be purchased book or music stores or direct from RCA anufacturing Company, Camden, New Jer-.

●

"On Hearing the First Cuckoo in Spring", Delius, is recorded on Victor Record #4496 by the London Philharmonic Orchestra under the sympathetic and understanding direction of Constant Lambert. Delius is possibly the greatest of modern English composers and one of the first truly great ones since Purcell. It is interesting to reflect that he may have had some inspiration for his work during his sojourn in America, where he worked in the orange groves of Florida. His music has a singular appeal. It is post-impressionistic in style and possesses much of the atmospheric charm of Debussy, plus an accent that is all Delius' own and prevents the confusion of his compositions with those of any other.

●

Just as with poetry and prose, Nature has provided the inspiration for many creations of the musician, both world famous and obscure. One such is Briccialdi's lovely "Wind Amongst the Trees" recorded by Clement Barone on Victor record #20344-A. More famous, of course, is Debussy's "La Mer—Dialogue of the Wind and the Sea". Here are Nature and the elements interpreted in musical terms by a master. Here is a record that one would find particularly interesting to play after a stormy day at the seashore. Victor has recorded it in Europe, the Orchestra of the Paris Conservatory playing this noted composition under the direction of Piero Coppola (#11651-A). This is a Red Seal record.

●

Those who combine a love of music with a love of Nature will revel in the recording on a Victor Red Seal record of Saint-Saëns "Carnival of the Animals". This is made by the Philadelphia Orchestra under the direction of Leopold Stokowski and brought out as #7200-A. Opening with the introduction of the royal march of the lion—in which there seem to be no cowardly lions—it continues through the musical presentation of the hens and cocks, the mules, the tortoises, the elephant and the kangaroos, which, we will have to agree, is a real animal carnival.

●

Drastic reduction in the catalog prices of Victor Red Seal and Victor Black Label classical and popular records has been announced. Price cuts amount to as much as one half in some cases. In announcing the reduction, Frank B. Walker, vice-president of RCA Victor said that "the recording art exists primarily to provide good music for the masses, when and where they want it." Both artists and music lovers are delighted with the lowered prices since they will assure a wider distribution of records.

Science Problems

Science has made such marked and varied progress that framing a science course presupposes careful selection and organization. The manner of approach, and the treatment of the subject matter in terms of daily life, calls for outstanding work by the author. In *Everyday Problems in Science,* by Beauchamp, Mayfield and West, collaboration has produced a thorough, simplified and orderly science textbook that should make the high school science course fascinating and valuable. This volume, in fact, stands out in sharp contrast with the uninteresting and poorly-interpreted science textbooks of a quarter of a century ago. Not only in the organization of the material, but in the physical presentation in terms of type and picture, this book is notable. Published by Scott, Foresman and Company, *Everyday Problems in Science* lists at $1.72.

When You Wish Upon A Star

You probably wish for everything good in life and if you were vacation-minded, you would want the hotel that offers you most; one that assures you of pleasant refined companions, bright cheerful rooms; solariums and a sun deck atop the roof with comfortable beach chairs, and an abundance and variety of fine foods.

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Nature in Print

By HOWARD ZAHNISER

IN THE course of *The Circling Year** Frederic F. Van de Water describes the distinctive glory of this month of October briefly but vividly.

"We have seen the birches," he says, "turn to gold and, coin by coin, pay earth's ground rent, and beeches blaze and tarnish, and, before their hue has left the slopes, have watched soft maples become pillars of still fire. Tall sugar maples have added their endless variations of yellow and orange. Then has come a pause and we have believed the display has ended and have been abashed as oaks have flamed and reluctant aspens suddenly have changed into clouds of sparkling sequins above pale trunks."

October, with its flaming foliage and birds migrating or returning for their winter boarding, is fortunately only one out of the whole round dozen of New England months that Mr. Van de Water and his beloved, oft-mentioned Althea have come to spend for some six years now at the old place in Vermont described in his earlier books, *A Home in the Country* and *We're Still in the Country*. Mr. Van de Water's own acres "spread so far," he says, "that even my loudest comments upon deer hunters cannot reach my neighbors' ears," and he thus has an opportunity that many of us envy to observe wild things at all seasons. Sensitive and appreciative, he is not unaware of the wildlife about his home, yet his new book is a chronicle of human affairs rather than what is sometimes called a Nature calendar. Domestic tranquillity, gardening, companionship with dogs—and pups—the quaint and charming neighborliness of his fellow Vermonters whose anecdotes he loves to quote, and his amiable struggles with the conditions of rural living—these are the realities of Mr. Van de Water's *The Circling Year*. It is significant to all who value the outdoors highly that the author and his Althea are convinced that the good life is best lived in the country.

Though one may wonder at Mr. Van de Water's somewhat protesting reiterations of his thorough satisfaction with the country and his renouncement of the city, he does arouse a congratulatory sort of envy. A professional writer, however, his circumstances differ widely from those of most modern Americans, who will probably be wise to enjoy his writings without staying awake nights wondering how they also can move permanently to the country. Some of the more fortunate ones—those, for example, who can afford a monthly expenditure of about fifty dollars in addition to their present housing budgets—may, however, entertain the thought of a compromise suggested by Virginia Kirkus in her highly practical *A House for the Week Ends*. If so, they can hardly afford to neglect this detailed, comprehensive volume written "to show you that your dream week-end home is a possibility, if you have just barely enough leeway in your bank account to allow for the 'double life'." Acquiring the home, furnishing it, gardening on the week ends, providing for "guests, pets, and pests," and emergencies, and budgeting the costs—all are made easier by Virginia Kirkus's counsel substantiated by her own experience and her careful observation of that of others. There is very little of the influence of wild things seen in *A House for the Week Ends,* but that, I surmise, is a result of the author's personal preferences. Others might enjoy less gardening and less entertainment, preferring to make excursions and study Nature, but they too will find this book an aid in reaching their objective if they choose a week-end house for their field station.

Those for whom Virginia Kirkus writes can only envy Mr. Van de Water, and at the same time will, she says, "disdain the alternative of year-round living in a suburb recently rural," knowing that vacation is "usually a meager fortnight." This admirably frank caution, together with the fifty-dollar-a-month *sine qua non,* will of course eliminate most of us from among the ranks of her practical readers—and make us all the more appreciative of such a book as Edwin Lewis Peterson's *No Life So Happy,* a delightful, perhaps allegorical, fictional account of a vacation on a trout stream by the teller of the tale and a fellow angler. Vicarious enjoyment of such a vacation coupled with our own reasonable anticipations may bring us some measure of that contentment which is great gain.

"After you've been on a stream a few days," says George, the camping and fishing companion, "you get to feelin' that you kind of belong there, an' you want to know things. Seems as though the woods and the creeks an' the things that live in 'em are important."

Shade Creek, the stream along which the events of this story are supposed to have happened, had just enough trout to test the fishermen's skill with nymph, worm, fly, and streamer, and an inquisitive reader should certainly know a great deal about how to catch trout after overhearing the anglers' conversations. But Shade Creek also had a fabulously large trout, and the (Continued on page 486)

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*Recently published books discussed in this article are:

The Circling Year. By Frederic F. Van de Water. New York: The John Day Company. 1940. 222 pp. $2.

A House for the Week Ends. By Virginia Kirkus. Boston: Little, Brown and Company. 1940. 252 pp., with index, bibliography, and illustrations by Dorothy Bayley. $2.50.

No Life So Happy. By Edwin Lewis Peterson. New York: Dodd, Mead & Company. 1940. 221 pp., with illustrations by W. J. Schaldach. $2.50.

Wild Bird Neighbors. By Alvin M. Peterson. Milwaukee: The Bruce Publishing Company. 1940. 283 pp., with index and 106 photographs. $2.

Voices from the Grass. By Julie Closson Kenly. New York and London: D. Appleton-Century Company. 1940. 248 pp., with index, bibliography, and illustrations by Henry C. Kenly. $2.

About Spiders: Introducing Arachne. By Elaine V. Emans. New York: E. P. Dutton & Company, Inc. 1940. 183 pp., with index, drawings by Viola A. Young, and photographs by Lee Passmore and O. C. Kuehn. $2.50.

The Spider Book: A Manual for the Study of the Spiders and Their Near Relatives, the Scorpions, Pseudoscorpions, Whip-scorpions, Harvestmen, and Other Members of the Class Arachnida, Found in America North of Mexico, with Analytical Keys for Their Classification and Popular Accounts of Their Habits. By John Henry Comstock; revised and edited by W. J. Gertsch. New York: Doubleday, Doran & Company, Inc. 729 pp., with index, bibliography, and 772 figures including photographs and numerous drawings. $6.

PHOTOGRAPH BY ARTHUR H. FISHER

FLIGHT HAS BEEN BEAUTIFULLY CAPTURED BY THE SCULPTOR IN THE SPLENDID MARINE CORPS MEMORIAL THAT STANDS ON THE BANKS OF THE POTOMAC IN WASHINGTON

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For the Wings of a Bird

Some interesting facts on the flight, speed and travel habits of feathered aviators

By JULIAN W. MACK II

Illustrated by R. Bruce Horsfall

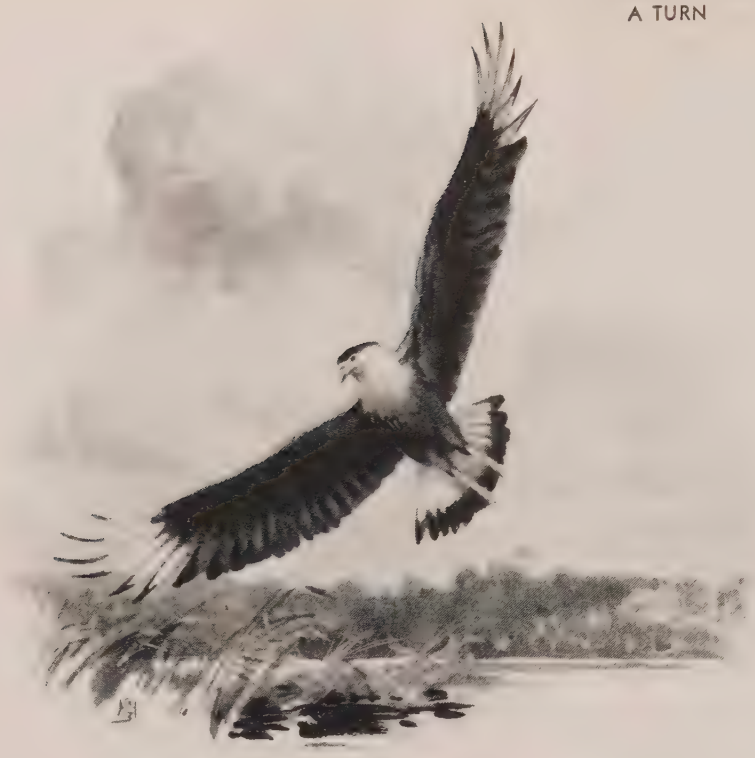
Most people think that birds fly automatically. Actually they have to learn to fly just as people have to learn to walk. There is also a great deal of mechanical action involved. Most species of birds have many characteristics that vary according to their needs. Not only do the various species differ, but even the individuals in any one species may have different traits.

A bird's flight is a complicated process that sustains it in the air and enables it to move from one place to another. The main instrument in accomplishing this is naturally the pair of wings a bird possesses. These wings are beaten in such a manner that they slice the air, instead of just pushing down, and pile the air up under the wings. Thus a vacuum is formed above the wings, and this has a great deal to do with supporting the bird in the air. When a bird wishes to glide it must produce more air beneath the wings and a larger vacuum above. Therefore, if there is a wind or airstream, the wings must be held at a greater angle to the airstream than when they are beating the air. When the wing is set at a large angle to the airstream "bubbles" are produced, which are the air breaking up at the end of the wing. This is just the same as when one trails his hand through the water from a boat, the two streams that go around the hand meet at the end of the obstacle and run into each other, breaking into bubbles. When this happens in a bird's flight the air rushes in to fill the vacuum above the wing and a stall begins. In an airplane a stall is often fatal, but a bird has various safety devices, of which more later. When the relationship of the air to the vacuum is reversed, a stall is produced. The air above is pushing the bird down and the vacuum below is pulling the bird down.

This essay concerns a subject that no one understands thoroughly. The reader, therefore, should remember that, while the statements are believed to be generally true, in many cases exceptions will come to mind. Also, it is not possible to explain fully all the points referred to. To go fully into all details would require a large book. The article should be understood, therefore, merely as an attempt to present, in a limited space, some of the conclusions reached by a careful student of this difficult subject.

The air resistance is another thing that helps to keep the bird in the air. The greater the force in the wingbeat, the greater becomes the air resistance and the recoil of the air when the wing is withdrawn. If the speed of the wingbeat equals the speed of the air in recoiling or replacing the vacuum, the bird will remain stationary. In order to ascend, the bird must beat very vigorously, since the rate of ascent is equal to the surplus speed of the wingstroke over the recoil of the air below.

There are several types of flight and these can be classified roughly as soaring and flapping flight. In order to figure the velocity of the soaring flight it is necessary to combine the speed of the wind with the speed of the bird. For flapping flight it is necessary to combine the theoretical speed of the bird with the personal exertion. This personal exertion is what enables the flapping bird to rise abruptly, a feat the soaring bird cannot accomplish. A man-o'-war bird was once kept securely in a cage twenty feet square and without a roof. This was possible because, being the world's greatest soarer, this bird could not rise above the fifteen-foot fence without a long run to get air piled up beneath him. This same theory seems to apply to airplanes since the auto-gyro can produce enough piled up air to rise quite abruptly without the aid of the wind, as can a flapping bird by its



AUDUBON'S CARACARA BANKING FOR A TURN

own exertion. In other words, speed is necessary for flight and without speed there can be no flight under any conditions.

Nature seems to have taken great care in providing her children with safety devices to save them from harm. One of these is found in separating wing-tip feathers. These are not found in all birds to the same extent. Only the flappers, with their comparatively short, stubby, and squared wings, have many separated feathers. The separated feathers are found primarily in the middle-sized and large birds, although they are to be found in some others. Although the exact use of separating feathers is not known, it is assumed that they are a safety device since they often form a different angle than the wing forms, preventing stalling and other accidents.

"Slots" are another safety device. These number from one to eighteen per wing and are found at the wing tips and the section called the wrist, which corresponds to the wrist in man. All small birds, as well as some larger ones, are equipped with slots. It seems that slots increase in proportion to the squareness of the wing. This is probably because a bird with square wings needs more help in controlling himself than other birds with larger wings. The wrist slots, or alula, open automatically when placed in certain positions. In summary, the number of slots vary considerably, depending primarily upon the shape of the wing, the squarer wings having more slots. They serve to prevent stalling and also give control at low air speeds, which reduces the loss of air efficiency. A new safety device has recently been invented for airplanes, an instrument equivalent to a bird's slots being attached to the wings.

The slots are produced by emargination. This is a cutting down of the width of the feather in the center. In non-separating feathers the feather is gently tapered, while in the separating ones it is suddenly reduced in the center. These emarginated feathers are so placed that they form parallel slots and are arranged in regular variation of size. These slots give a drag in the air, which somehow produces silent flight. To a certain extent the slots can be opened or closed at will by controlling the relation of the feathers to each other. Of course, in the wrist slots the movement is almost entirely automatic. Some birds have single slots while others have multiple slots.

Another safety device to be found in a bird's wing is the bending or twisting feather. Even if a bird's wing is bent past the stalling point, the feathers that bend or twist to the correct angle will sustain it in the air. Sometimes a bird will stall in order to lose speed and then these bending feathers come in to good advantage. When the airstream hits these feathers, it bends them to the proper angle.

Now we come to the important matter of directional control. Obviously if a bird is going to fly through the air it must be able to control the direction in which it flies. There are several methods by which this control can be obtained. For control of the up and down movement, the tail is the main controlling instrument. The tail is really a wonderful thing. It can be elevated or depressed to force the body up or down. It can also be furled, spread to any degree, and shifted from one side to the other. In order to make a fast turn a bird uses a method much like that used in rowing a boat. He back-waters. That is to say, he beats fast with the wing on the side towards which he does not want to turn, and holds the other stiffly in place. Also a bird may sometimes actually beat his wings in the wrong position in order to effect a fast turn. Back-watering in this manner drives the air under the tail, which can be manipulated so as to deflect the current and turn the bird. With some birds that possess long necks, a change in direction can be easily produced by turning the head, or raising or lowering it. I suppose all birds use their heads and necks to a certain extent in turning, since it would make a slight change in the center of gravity and a consequent change in direction. Some birds with very short tails, such as the ducks, use their feet to help the tail. The loons also utilize this aid to a great extent. The feet are held up against the tail or are trailed. These birds are powerful swimmers and have large feet for use as paddles.

Although the tail is without doubt the most important factor in steering, a bird can get along without it. Some precocious birds, such as grouse, develop "first" tails that

are of little help. When just getting their "adult" tails, they are conspicuously handicapped. I have observed a cardinal that lost its tail, but it soon developed a limping flight of its own, and did rather well.

When a bird is at rest its wings are close to the body. Those that jump into the air let the wings hang loosely before taking off. There are three ways of getting into the air, and two ways of staying there and moving when there. Many birds jump up into the air and then rapidly beat the wings to get speed. Their wings are loosely held; then after the jump the wings are straightened and raised slightly. After that they are brought down strongly. This process is continued in the air, causing flight to be a series of jumps. Another way of taking off is to run or swim a considerable distance into the wind to get the air piled up under the wings. This, of course, is the method generally used by airplanes. Still another method is to climb to the top of some tree or cliff, or even a high rock, and jump off. Some birds, notably puffins, have been known not to get enough momentum when doing this and to fall to the rocks below.

THE EAGLE BACK-PEDALS TO MAKE A LANDING

When a bird wishes to land it is usually necessary for it to check its impetus. This may be a difficult feat, for the point of landing may be very small and require close estimates of wind and velocity. This checking of speed is done by spreading the tail and beating backwards with the wings. The wings also are spread and the tail and wings are placed perpendicular to the line of flight.

Birds that lead different types of lives have different needs, and these needs are clearly shown in the shape and size of their wings and feet. A swallow, for example, has small feet. This is because a swallow spends most of its time in the air, even capturing its food on the wing. A quail, however, a typical ground bird, has large, strong feet, and short, stubby wings. It has to scratch for its food and walk about looking for it, and needs flight only to get away from some foe, in which case it must fly fast, but only for a relatively short distance. Some birds, by virtue of having lived where they do not need to fly to escape their foes or get food, have become flightless. Their wings either became adapted to swimming or some other form of transportation, or else became altogether useless. Such birds frequently are exterminated by man.

We said that soaring birds have large wings. That means that they have large surfaces with which to catch the air currents that support them. The heavier a bird is, the better soarer it is, always assuming that it has the necessary surface in proportion to its weight. This is also one of the reasons that few small birds are soarers, unless they have very large wings in relation to their weight. The man-o'-war bird, probably the most wonderful soarer of all, has a wing span of about eight feet, while its body is no larger than that of a good-sized hen.

A soaring bird soars on rigidly-extended wings. If there is no wind, it will glide to the ground unless it flaps. If there is a wind, it will probably rise in a sweeping circle, making use of the wind. The general position assumed by rapid soarers is an angle of about one hundred degrees. This is measured by using the end of the beak as the vertex of the angle. The difference between slow and fast soarers is found in the angle of the wings. The fast soarers are usually birds that capture their prey on the wing, such as the swifts or swallows. Among the slow soarers are the falcons, which soar about looking for their food and then descend after it. The slow soarers use an angle of about two hundred degrees instead of one hundred. When circling, the birds are naturally always drifting toward the lee side. When soaring across the wind, the birds cant their bodies with the upper side away from the wind.

The flight of flapping birds is, however, a different matter than that of the soarers. The flapper crouches to spring into the air with its wings loose. This presents the edges of the feathers to the wind. On the down-beat, the wing is stiff and fully spread and then loosened again for the up-stroke. The bird's wing is divided into three parts in such a manner that on the up-beat it naturally falls into position so that the wing is turned edgewise to the wind, thus reducing the air-resistance.

A combination of flapping and soaring flight is often used by some birds. These include such varied types as grouse, sharp-shinned and other hawks, goldfinches, and pelicans. They flap for four to a dozen strokes and then glide. The pelicans have a definite rhythm with the number of flaps and the length of the glide proportional to the wind. Beebe reports seeing cormorants fly in line with pelicans, which always fly in single file, and flap-flap-flap-gli-i-i-iding with them. This is unusual, since the cormorant

is a straight flapper. It shows the bird's resourcefulness.

Various birds also have widely different wing-beat speeds. These vary greatly with the needs of the bird. The highest number of wing-beats attainable is that reached by the hummingbird—anything up to two hundred strokes per second. Although many hawks and other birds habitually hover over the ground by rapidly beating their wings, and even sometimes going backwards a little, the hummingbird is the only land bird that regularly flies backwards. The rapid wing-beat is, of course, responsible, although there is more theory needed to explain this than merely speed in wing-beats. The next in order is the sparrow, with a total of thirteen strokes per second. The speeds diminish slowly from that point. Swifts have ten; ducks, nine; pigeons, eight; marsh harrier, five and three-fourths; screech owl and green parrot, five; carrion crow, three to four; bluejay, three and one-third; buzzard

SOME BIRDS, LIKE THE APTERYX, HAVE LOST THE POWER OF FLIGHT

(hawk), three; paddy bird and black vulture, two and one-fourth to two and one-half; white scavenger vulture, two and one-fourth; adjutant, two to two and one-fourth; heron, two; stork, two; and, finally, the pelican—slowest of all—one and one-sixth strokes per second. Of course these rates are subject to change depending on flying conditions and whether or not the bird is in a hurry. A bird can speed up the wing-beat to a certain extent by merely exerting more effort. It seems to show that, allowing for discrepancies because of the weight of the body in relation to the wing area, the smaller a bird is the faster wing-stroke he has. An interesting fact in connection with this topic is that the only bird to beat its wings alternately is the swift, and this not all the time. I do not know, however, that this fact proves anything.

The speed at which most birds fly is from thirty to fifty miles an hour. Probably the fastest on record is the swift, which is credited with two hundred miles an hour. Chapman (Birds of Eastern North America) gives the following miles-per-hour records: Ducks, 44-59; geese, 42-45; corvidae, 31-45; smaller Passeres, 20-37; starling, 38-49; domestic pigeon, 30-36; great blue heron, 28; sparrow hawk, 22-25; red-shafted flicker, 25; raven, 24; horned lark, 23-28; logger-head shrike, 28; brown pelican, 26.

Aymar (Bird Flight) gives the following miles-per-hour rates: song sparrow, 17; northern flicker, 25; bronzed grackle, 27-35; finches, 30-33; robin, 22-26; swallow, 34-37.75; falcons, 40-48; albatross, 49; waders, 34-51.

There are two general types of flight, the migrations and the local flights. The local flights include all the short flights in search of food, etc., during the stay in the summer and winter. They also include such special flights as the mating flights indulged in by certain birds. The snipe, woodcock, and others use these mating flights, and they and others, such as the hummingbirds, perform many aerial acrobatics to win their mates. Other birds, such as certain of the grouse, attract their mates in a unique way. They rapidly beat their wings against their bodies, usually on a log, and thus produce a thundering roar, which can be heard as far as a mile away.

The speeds listed above were for local flights. In migration everything is different. Even though the individual birds comprising a flock are capable of much greater speeds they sometimes travel quite slowly. Speaking of certain day fliers, Cooke says that the average migratory speed from New Orleans to southern Minnesota is twenty-three miles per day. From thence north they go faster every day. The nocturnal fliers may make as much as two hundred to four hundred miles a night.

Another thing about flight that is quite different during migrations is the height at which the birds fly. During the migrations most birds fly at about three thousand feet. Anything over five thousand feet is more likely to be the exception than the rule. However, four or five thousand feet is not an exceptionally high flight, as it has been frequently observed. At other times the height is varied, subject to species and conditions. For instance, A. L. Thomson gives a record of migrating swallows at 1462 feet; cranes at 1625 feet; a lark at 6175 feet; two storks and a buzzard at 2925 feet; and an eagle at 9750 feet. One of the best ways of learning a bird's height is from an airplane, and from the records of the Royal Air Force in England we get records of rooks at 10,000 feet; ducks at 7500 feet; lapwings at 6500 feet; a golden plover at 6000 feet; and geese at 700 feet.

I find the very interesting fact that birds fly at different heights under different circumstances well illustrated in the reports made by Capt. C. Ingram during the World War. Remember that the Royal Air Force reported geese at 700 feet in peace time. Capt. Ingram reports geese flying over the scene of battle at 9000 feet, very high for geese. He also reports sand- (Continued on page 490)

JUST ABOVE THE FLYING OCEAN SPRAY THE TORREY PINE BEARS ITS CONES

The long leaves and multi-leaved quills of this pinyon are shown here. It is the rarest of the nut-bearing pines of the southwest with a range limited to one small mainland area and one island

The Magic of the Pinyons

The story of the nut pines of the Southwest

By LAURENCE M. HUEY

Photographs by the Author

"NO, NO! That isn't the way to eat pinyones," said the man who had just poured a brimming handful of golden brown pine nuts into the shirt pocket of the small boy, who was eating them, hulls and all. He did, however, qualify his remark by adding, "I'll admit that an Indian friend of mine claimed he could keep a steady stream of pine nuts flowing into his mouth at one side, taking out the kernels with his front teeth and discharging the shells out of the other side." I was the small boy and, with the passing of years, I do not believe the story of the Indian and his dexterous teeth. In reality, it is a slow process to eat "pinyones". However, it was a picturesque claim, stimulating the young imagination and suggesting that there was a supreme gustatory performance possible in eating pine nuts.

Thus, at an early age, I was introduced to that delectable delicacy enjoyed since time immemorial by wood rats, squirrels and primitive man. This first taste whetted an ever ready and never satiated appetite for the seeds of these pines, and a desire to learn more about the trees. So I have spent many pleasant hours beneath the sheltering branches of the pinyons that clothe desert mountain ranges in the southwest. The torrid rays of the summer sun and the heated desert winds wrest from these trees a perfume so fragrant it is never forgotten by the traveler who has once enjoyed it. Like the taste of the roasted seeds, it gives him a longing to return to their desert haunts again and again.

Three species of pine trees bearing edible nuts grow in the southwest. These are the single-leaved pinyon, the Parry pinyon and the Torrey pine.

The first two species are grown as a crop in some re-

THE THREE EDIBLE NUT-BEARING PINES OF THE SOUTHWEST

First the most common, the single-leaved pinyon; then the Parry pine with a range extending into Lower California; below, the cones of the Torrey pine, named for the noted botanist who worked with Asa Gray

gions, but the Torrey pine is so limited in its range that the use of its seeds for food passed with the natives who lived within its range. This pine is included only because of its rarity and its botanical relationship to the other two. The Torrey pine is found growing today in its native state in only two well-separated localities in southern California; one on the mainland, a few miles north of San Diego, the other on Santa Rosa Island, off the coast of Santa Barbara County. The mainland groves are almost all within protected bounds of municipal or private lands, and the island trees are saved from vandalism by their isolation.

The Torrey pine is unique in that it is the only pinyon to make its home by the sea. Periodically bathed by ocean fogs, its limbs are blown into twisted, grotesque shapes by cool, incessant, moisture-ladened, westerly winds. The other two species of pinyon trees grow in the arid, rocky, desert mountains, and each year withstand cold, biting, winter winds with occasional snows; and in summer, excessive drought and heat.

The Torrey and Parry pines have multi-leaved quills, four or five needles, or leaves, in a single quill. The needles of the Torrey pine are much longer than those of the Parry pine, and the cones are larger. The trees of both attain a height of from thirty to thirty-five feet, and a diameter of fourteen to sixteen inches at their bases when growing in sheltered positions. They differ considerably in shape and in the texture of their wood. Neither are of commercial value for lumber, their numbers being too few, and their trunks too small.

The Torrey pine bears the name of the celebrated botanist John Torrey, who was a contemporary and co-worker with the renowned Asa Gray. The Parry pine was named for C. C. Parry, who first collected specimens of the tree on the Mexican Boundary Survey in 1853.

The Parry pine is another of North America's rare pine trees and has a restricted range. Almost all of the trees occur on the north and west slopes of the Sierra Juarez and Sierra San Pedro Martir, two short mountain chains extending, end to end, south from the United States-Mexico boundary into Lower California, a distance of about a hundred miles. A few scattered trees are to be found on the desert slopes of the mountains in San Diego County.

It is through this Mexican region that a few remaining Indians still harvest the pine nuts from the Parry pinyon. Each year the Indian families travel into the pinyon forests in which the crop is heaviest, gathering the cones by knocking them from the trees with long poles. This harvest is carried on during late August and early September, just before the cones open naturally to drop their seeds.

The cones are picked up in large carrying baskets, and, when a fair-sized accumulation has been made, a fire is kindled. When this fire has been burned down to a mass of glowing embers the Indians cast in heaps of the unopened cones. These are stirred to keep them from burning, and the heat and this movement combine to open them up so the pine nuts will fall out. By the time the embers have died the nuts have all been roasted, and are recovered from the ashes by winnowing with a flat wicker basket. It takes considerable skill to do this job correctly, but these Indians are most adept.

HABITAT OF THE SINGLE-LEAVED PINYON TREE
It grows in open stands such as here in the Inyo Mountains of California

The seeds of the Parry pine are larger and have a better flavor than those of the single-leaved pinyon, but their limited range restricts the amount available for sale. Thus few persons have experienced this epicurean delight. However, these pine nuts form a definite part of the staple diet of the primitive peoples who live within the range of the Parry pine.

The most widely-ranging tree of this group is the single-leaved pinyon. It is found growing in rocky, arid soil on desert mountains from northwestern Arizona, southern Utah and Nevada to east central California, and down the peninsula of Lower California. It differs in several ways from the other two pinyons. The leaves are single—only one in a quill instead of several—and they are short and rather heavy. These characteristic heavy leaves seem to accentuate the needle-like point, which, although common to most pine leaves, seems to jab the harder when touched, due to its inflexible stem. The forests of single-leaved pinyons grow in open stands, and the trees are never as large as either the Torrey or Parry pines. They are, however, symmetrical, and tolerate little or no underbrush about their bases.

Within the wide range of this single-leaved pinyon live many different tribes of Indians, and each year they gather the nuts for food. From this source come the few pine nuts offered for sale on the counters of stores. They are not as large as those from the Parry pine, nor is the flavor quite as good, but, once tasted, they do make one want more.

Several methods are used to harvest pine nuts, although for eating the nuts are always roasted. Knocking the green cones from the trees with long poles, and then roasting them in small fires is most usual, but a unique and most resourceful procedure is to rob the stores made by wood rats. Before the trees commence to drop the pine nuts by the natural drying and opening of the cones, the Indians locate the wood rat nests in the forests where the trees are most heavily laden with cones. As the pines drop their seeds the wood rats gather them from the ground beneath the trees and store them in their nests. Clean, methodical and industrious little animals, they have an unfailing way of gathering only the full, ripe nuts. These are deposited in their nests in spaces set aside as granary departments, and if the crop is heavy, the rats work as long as pine nuts are available. It is these winter stores that are systematically purloined by the Indians.

In the process of roasting, glowing embers are placed on a flat wicker basket and the right amount of pine nuts is poured among them. Coals and nuts are kept continuously agitated, or stirred, by either bouncing them up and down in the basket or by swift backward and forward movements. The least pause, before the nuts are properly cooked, will result in burning both the nuts and the basket. Considerable skill and dexterity is necessary, and the Indian women are extremely proficient at the task.

Thus, through the ages, the pinyon trees have served primitive mankind. Today, during the warm summer months when a weary traveler seeks shelter beneath their limbs the pinyons cast upon him an irresistible spell. The soughing of a gentle breeze through bristling leaves makes enchanting woodland music, and the fragrant piny perfume offers rest for both mind and body. The solitude amid the desert mountains adds a charm all its own, and with it is a desire to return again to such surroundings. Desert wanderers call it "the magic of the pinyons."

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THE HONEST DEBTOR

By BELLE CHAPMAN MORRILL

In lavish or in scanty years,
Come drought, or flood, or cold,
September first, the summer's bills
Are always paid in gold.

"A Day for Gods to Stoop— And Men to Soar"

By LOUISA R. GLEASON

SOMETIMES there comes a day in early September when the gods of wind and clouds and sun set me atingle with an irresistible longing to be out and away; to be a wild being in untamed places, buffeted and blown about by a bracing northwest wind; to scramble up and down rocky, battered headlands; then to return home tired, satisfied and inexpressibly happy. A rugged island off the coast of Maine, another in Lake Superior, have furnished such rare, paganish experiences. One lingers long in memory; a day when the gods stooped to the lake island; when a westerly breeze, glowing sunshine and clear, fresh air sent me striding along a trail bound for the wild coast on the far side of the island.

". . . CLUSTERED AROUND AN OLD HEWN-LOG TROUGH . . ."

The sun was high, flooding the open water with light on one side, held back by a thick leaf-canopy of dense hardwoods and evergreens on the other. Within the shade of the woods, outcropping gray rocks, partly hidden by mosses and lichens, were the foreground of a repelling darkness beyond. Fallen giants of other days lay rotting and black, broken skeleton branches outthrust. The whole atmosphere of the forest seemed to say, "Keep Out", while the narrow path curved enticingly among nodding grasses, dodged pines and small birches almost toppling into the water, and paused to spread out at a spring where jewel-weeds, decked with golden and green pendants, clustered around an old hewn-log trough from which crystal drops trickled softly. The jewel-weeds are gangs of gamins. They stand quietly in their yellow-green dress, dangling their ornaments artfully, and wait slyly for the unwary to pick a seed pod; then they snicker when their startled victim drops the squirming thing. I know they snickered for I felt exactly the way I do when small boys are around on April Fool's day.

But the path played no tricks. It took a crosscut through a grove of hemlocks, threaded a tongue of cedar swamp and lost itself among coarse pebbles that lined the shore of a deep cove. On either side a towering cliff jutted into the restless expanse of Big-Sea-Water. A sense of freedom filled me. Here was room to breathe, to expand, to come alive again. Mercury lent wings to carry me on along the wide strip of white stones, scrubbed clean by tumbling seas. Phoebus shed his warming rays over a great boulder that dabbled its foot in a placid puddle and lured me to its smooth-worn top. There, like the little path, I too became lost in the immensity and grandeur spread before me.

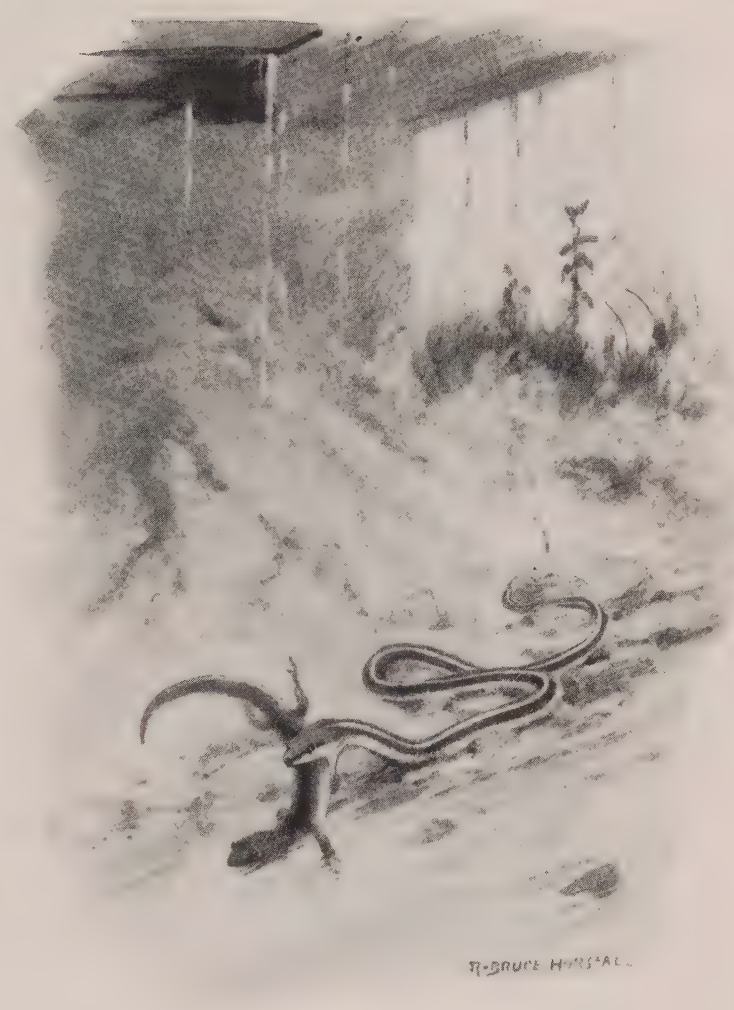
Nothing but glistening water stretching into empty distance, soft white and grayish clouds, floating islands of delicate meringue, drifted easterly in stately procession across a field of faultless, translucent blue. The fickle gods were at peace with themselves and each other, and were bending graciously toward aspiring mortals. Occasionally a lone herring gull, with silver-gray or brown mantle, sailed down the wind on effortless wings; a flock of twinkling terns, poising, diving, and whirling up again, roved aimlessly, bound for nowhere. Three American mergansers, rough-riders of choppy seas, were bobbing on the wavelets below one promontory. The swishing waters gave them food, and, for their nesting sites, scouring surges had fashioned shelves and nooks where vegetation clung precariously. Surely this forbidding shore, with its turbulent waters, offered them a safe dwelling place. Above them and close to the precipitous cliff-edge, a broken line of evergreens concealed a deer trail that bordered an untamed interior of swamp, tangled underbrush, fallen timber and branchless trees with compact green tops. Idly I watched

the passing panorama, lazily searched the grassy intervals along the trail with my binoculars, half hoping a proud albino buck, that lived within the fastness, might step out from the shadows. Meanwhile, with Homer, I "lost the cares of life in pleasing rest", drugged by a sense of security and well-being.

Abruptly I was showered by a slapping wave. The temperamental gods were quarreling and venting their spite upon a helpless world. Black clouds, hidden by hills and trees, had come up behind me and were shutting out the blue sky. Far away Jove was muttering and the cheering lights were gone from the surface of the lake. Those sparkling ripples that had seemed to be tumbling and laughing with the abandon of carefree children, were now a horde of darkened, furious breakers, each rushing with a snarl higher and higher up the shore. Baffled, they receded, dragging at the stones worn round and smooth by thousands of years of such raging onslaughts.

The blotting out of the sunshine brought a chilling and unwelcome conviction that summer was about over and fall close at hand. Suddenly, I seemed to be the only living thing in all that roaring wilderness. The gulls, terns and mergansers had vanished, and I, earth-born being, bereft of godly favor, beat a hasty retreat from the wave-threshed shore to the forest that grew among undulations of sand, mute records of long-ago tempestuous seas. A ruddy glow from the tall trunks of towering red pines and a thick carpet of brown needles and scattered cones, gave an agreeable feeling of warmth, but held an ominous quiet. The gale of the open lake was only a swishing whisper in the lofty tree tops. There was not a sound or movement of animal life; no tiny bird note; no scampering squirrel; no shy deer, startled by my approach, bounding off to find cover in the swamp half a mile further on. The birds are my unfailing weather prophets. If they continue to chirp and flit about, the threatening storm will not amount to much, but if they disappear and the woods are full of silence, it behooves humans to be on the lookout for shelter. So I took to the old tote road, which still made a dim track through the pines, and hurried through swamp and hardwoods.

Rain was falling as I crawled under an old bridge that once had spanned a shallow brook. I settled myself on my heels, hunched up as high as possible under the thick, broad planks at one side. As I turned up my coat collar and turned down the brim of my hat to ward off leaks between the boards, I caught sight of a small garter snake gliding up the now dry stream bed. Big blobs of rain spattered around him as he slipped under the edge of the bridge and stopped, his twelve inches of striped buff and black ribbon resting in graceful curves among the pebbles.



"... THE SNAKE CAUGHT HIM SQUARELY IN THE MIDDLE ..."

He wore a spick and span coat that stood out like a misplaced sunbeam in a gray fog. Faster and faster the rain thudded on the dirt-covered planks. A few drops seeped through, washing out the gritty filling. Thin sheets of water poured down, gathered in the pockets of the stream bed and washed against the snake. He began to move farther under the planks, slowly weaving in and out among the rubbish of small sticks and stones, seeking slightly higher ground opposite me. Then he stopped, lifted his head high, fixed hard, bright eyes intently on something ahead and was motionless, his slim length braced against the increasing force of rapidly forming tiny rivulets.

In the woods above the bridge the downpour of rain had routed a plump Jefferson's salamander from his dark hollow under rotting leaves. He too had followed the easier way of the brook bed and sought to hide his small brownish-black body among the shadows of the bridge. Pursued by pelting shower, he scampered under the plank roof. A flood was gathering behind him as he heedlessly scrambled on toward the rough foundation and the waiting snake. Without any warning the snake caught him squarely in the middle, between front and back legs, its mouth stretched to its utmost. The salamander filled it to overflowing and instantly every ounce of him went into violent action. Head and tail beat together against the

snake, then swung outward, ramming a bulging body hard into the snake's straining jaws, jarring him from his pebble hold. With the swiftness of the lightning flashes above, the salamander pummeled and writhed. Never did battle rage more fiercely on the plains of Ilion, while Jove thundered and swift Scamander rolled his rapid floods. Achilles, the stern attacking snake—Hector, valiant defensive salamander—strove for the right to live. No coats of mail clothed their bodies and if they besought the help of their sylvan gods, who could know? The battle was to the death and they fought as mightily as heroes of old with the odds in favor of Achilles. Holding firmly during his victim's contortions, the snake tried to find a better anchorage against the ever-rising tide of water that was pushing them downstream. The tip of his tail sought here and there for a rocky knob around which to make a loop. If the salamander rested a split second the snake immediately took a fresh grip and the fight was on again. They churned the muddy water into waves and eddies that crept higher and higher along their sides. From miniature ravines and canyons above, a torrent, swollen by streams falling from the cracks in the bridge, swept down upon them, rolled on to be followed by a larger one, and yet still larger. Desperately the snake gripped his tail around a projection of rock above water line. Frantically the salamander twisted and thrashed. Jove shook the universe and Scamander rose in all his wrath. A wall of clay-filled water rushed upon them, caught the snake full in the face, strangled him, broke his hold upon his prey, tumbled him around helplessly and raged on down the gully, carrying with it the squirming salamander. Scamander, with no Vulcan to burn up his devastating floods, had come to the aid of Hector.

The rain stopped. Indifferent to a lost banquet, the snake slid into the sedges by the roadside. It was all in the day's work for him—and for the little salamander. "Hunter and hunted" was life's game in which each played both roles as opportunity offered or occasion demanded. Jove's thunder died away in the distance, and only drops from the trees splashed on sodden leaf-mold.

Stiffly, I crawled out into clean, newly-washed air where no hint of near tragedy lingered. I was glad to picture the battle-scarred salamander resting safely under moist brown leaves, and slowly turned for the remaining homeward mile. Far-reaching sun rays fell slantingly through the woods that had been so dark when I passed in the early afternoon. They were no longer repellent but briefly and gloriously illumined; aisles of golden light, long thin black shadows, rocks softened and padded by revived mosses. The gods had taken their wrangling to lofty Olympus and a thoroughly wet mortal plodded contentedly along.

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In October, 1939, and January, 1940, we published stories of Famous Gardens by Robert Clark. These were to have been the start of a series, but the author passed away shortly after the second article appeared. Poet, author, naturalist, psychologist, sports enthusiast, social worker and Christian gentleman, Robert Clark was a beloved member of the faculty of the Montana State Normal School at Dillon, Montana, for thirty-four years. Playing an excellent game of golf at 69, it was his pleasure, when his ball strayed now and then into the rough, to hunt moss agates and do a little botanizing. Life to him had many facets, and he loved them all—and was much loved. After his passing, at the home of his sister in New Jersey, where he had come for a rest, a poem inspired by the Eastern fall was found among his papers. It was his last writing, was untitled and had not been given its final polish. As a tribute to one whose passage through this life was an inspiration to many young people, we publish this poem here, and we have presumed to give it the title—

But Yesterday

By ROBERT CLARK

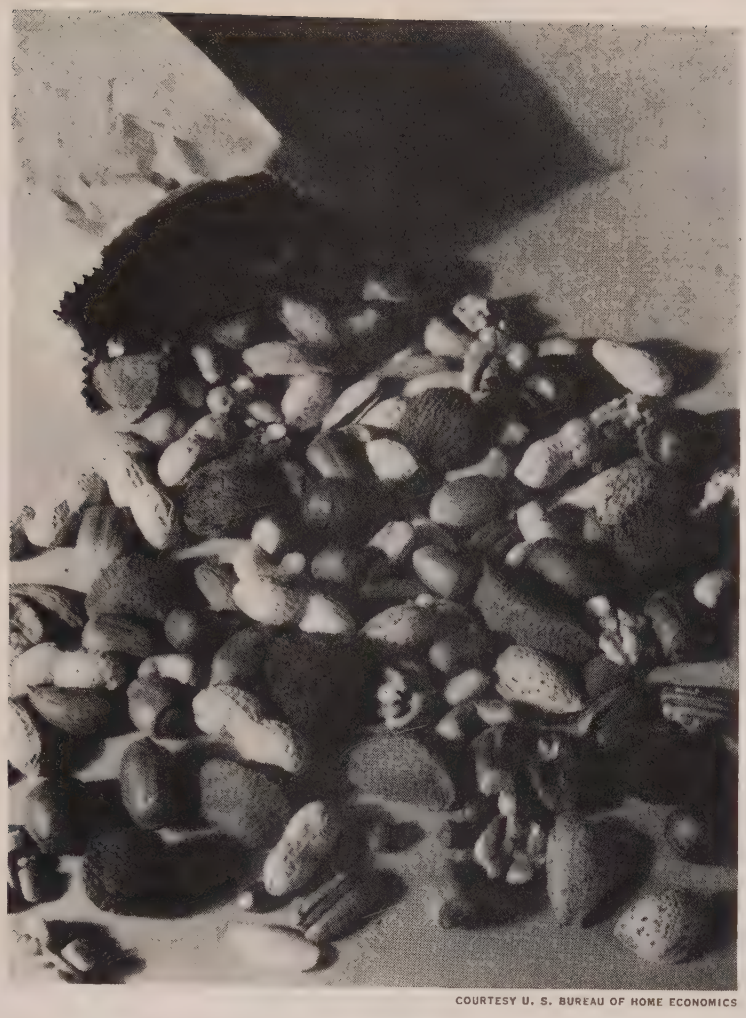
It is but yesterday;
A cascade flows
A'down the nearby hill;
The outpour glows
In loudest colors—still.

It is but yesterday;
Did ever such
A wealth enrich the leaves?
A Midas touch
Each village tree receives.

It is but yesterday;
My yard ablaze;
Or have my trees been fed
With sunset's rays—
A crimson—scarlet—red.

It is but yesterday;
A bronze display
Of artistry Divine,
Supreme array
These full-leaved oaks of mine.

And now it is today;
Their glory fled,
Gaunt skeletons stand bare—
Bronze, yellow, red—
All gone—that beauty rare.



COURTESY U. S. BUREAU OF HOME ECONOMICS

SHELLED ARISTOCRATS

Edible nuts move in the best dietary circles

By DOROTHY PARKER ROWE

This story of the importance of nuts economically, as food and in many other ways, supplements the special educational insert entitled "Nuts" found on pages 461-468.

"MISS CASHEW is snobbish—her sudden rise to favor has turned her head." Dowager Dame Pecan, although broad of beam, managed to edge toward the center of the nut dish.

"Are you, perhaps, a little envious?" Miss Cashew rolled over behind Mr. Brazil Nut's protecting shoulder.

"You're both naturally fresh," grumbled King Walnut from his superior position atop a seven-layer cake with marshmallow icing—"no wonder they salt you."

And so it goes. Each year class warfare is carried on in the World of Nuts over their individual popularity. For nowadays nuts move in the best circles. Oh my, yes!

Almost everyone likes them. Even the lowly peanut, which is not a nut at all, is right at home on a table appointed with fine linen and shining silver, in the company of caviar sandwiches, de luxe bonbons, and French pastry. A party is hardly complete without some nuts to nibble.

Nuts have been an important food since colonial times. It may well be that beechnuts were gathered by the Pilgrim Fathers for their first Thanksgiving feast. Before that, nuts comprised one of the principal foods of the Indians.

It is recorded that the peanut was introduced into this country from the tropics during the early period of colonization. Today it is an important money crop in no less than nine southern states. Its by-products are legion.

Those who have experimented with the properties of vitamins tell us such nuts as almonds, pecans, hazelnuts, chestnuts, Brazil nuts, and walnuts are good sources of B_1, or thiamin, so necessary for a healthy appetite and for maintaining the normal muscle tone of the digestive tract. Nervous irritability, they say, results from continued use

COURTESY U. S. FOREST SERVICE

BLACK WALNUTS HAVE FORGED AHEAD IN POPULARITY

Here is a typical tree growing in the George Washington National Forest in Virginia. Besides its yield of nuts, this tree is pleasing and has decorative values

of a diet low in thiamin. And who wants to be irritable?

The cash farm income in the United States from four tree nuts—almonds, filberts, pecans, and Persian "English" walnuts—was $18,930,000 in 1939—a gain of 2 percent over 1938.

Sales of nuts will probably reach their peak for the year in two months' time when filling the children's stockings becomes an engrossing national diversion. It goes without saying that the 1940 infant who "hasn't seen Christmas yet" will, on that day, be initiated into the intricacies of mixed nuts. What better swells out the tiny toe of a little sock than a pecan, for example, with its satiny smooth surface? And what better provides those mysterious-looking bulges in the Christmas stocking than a round walnut or a fat filbert?

Introducing the young at an early age, as we do each Christmas season, to our home-grown nuts, may have some bearing on the fact that one-fifth of our domestic nut production comprises wild nuts, harvested from forest trees.

There are at least ten commonly-known kinds of edible nuts growing wild. Some of these have been domesticated and improved by means of grafting—an exacting profession requiring highly-specialized knowledge—but they are still native Americans in which we may take much pride.

Although the fancy large, thin-shelled varieties of pecans that are a specialty of the holiday trade are the product of cultivated orchards of trees raised in nurseries from budded or grafted stock, the bulk of the pecan crop is derived from wild trees growing in profusion in the river bottoms of Texas, Oklahoma, Louisiana, and other states south of the Ohio River. Indeed, the percentage of pecans on the market coming from forest trees is progressively increasing. From 1928 to 1932 the average annual production of pecans was sixty million pounds, of which only thirteen and one-half million were from the improved varieties. In the year 1936 approximately ninety-five million pounds of pecans were produced, of which no less than eighty million pounds came from seedling or wild trees. In other words, more than three-fourths of all pecans marketed are wild nuts. It is also interesting to note that imports of pecans, all of which are shipped in from Mexico, are decreasing and exports are increasing.

That the pecan is distinctly of American origin is evidenced by the fact that early explorers have left accounts stating that the Indians gathered the nut annually. In fact, the word "pecan" is of Indian derivation, meaning any hard-shelled nut.

The number of wild pecan trees in Texas has been estimated as anywhere from ten to seventy-five million. Additional uncounted millions grow in other southwestern states, chiefly in valleys and river bottoms. About ninety percent of the wild crop comes from Texas, Oklahoma, and Louisiana, although the nuts are harvested as far north as southern Indiana and Illinois.

According to present-day records, wild pecans were first shipped to marts of commerce in large quantities by one Alex. Wooldert, a wholesale grocer living in Texas. Credit is given Wooldert as patentee of the original screw device for cracking pecans lengthwise, thus making it possible to extract most of the kernels in full halves free of the bitter inside shell particles. This, of course, added considerably to their economic importance.

Select individual trees in the woods, bearing large, thin-shelled nuts, have been sold for goodly sums of money to nurserymen, who propagate the strain by budding or grafting. Superior varieties have thus been produced from wild stock to furnish the high-class pecan for commercial orchards.

Several wild pecan trees are noteworthy for their unusually large yield of nuts. A tree by the name of Jumbo Hollis growing near Bend in San Saba County, Texas, has been bearing nuts for more than 300 years, it is believed.

This tree ordinarily yields from 300 to 500 pounds annually, but in one year it is known to have produced 1105 pounds. The Hollis is one of the largest and heaviest pecan nuts on the market, averaging close to half an ounce each in weight.

Topping the seasonal record of 1105 pounds made by the Hollis tree, the Hohen Solms pecan, a giant tree in Louisiana, south of Baton Rouge, is said to have borne as much as 1600 pounds of nuts in one season. The Louisiana tree is six feet in diameter and has a spread of 132 feet. In 1927 the National Pecan Growers' Association dubbed it the largest pecan tree in the United States.

Wild trees, for the most part, are given practically no care, and the only effort expended on them is in clubbing them and gathering the nuts. As a result, scale and other diseases have killed great numbers of trees. However, many wild groves have been posted by landowners, cleared of brush, and given varying degrees of cultivation, including, in some instances, the grafting of trees to improved varieties.

Most of the cultivated crop reaches the consumer in the form of whole nuts, and a large part of the wild crop is sold to cracking plants. Here factory methods have greatly stimulated kernel production so that large quantities of the meats are available to bakers, confectioners, and dealers in salted nuts and ice cream.

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HISTORIC PECAN TREES AT MOUNT VERNON

Thomas Jefferson gave George Washington some of the nuts to plant at his home above the Potomac, and the thousands of visitors to this shrine may now see the result

Two pecan trees of historical interest are growing on the Mount Vernon estate from nuts that Thomas Jefferson gave George Washington to plant. The taller of the trees is thirty inches in diameter at breast height. This tree is 120 feet tall; its companion tree, 34 feet.

Another native nut that has become commercially important in recent years is the black walnut. As far as is known, there has never been a market surplus of black walnut kernels. For more than 35 years the demand has increased steadily.

The original trade in both kernels and nuts is between country merchants and farmers, and some of the largest collecting and distributing centers are located in New York, Baltimore and Chicago. Although no reliable estimate of the magnitude of the black walnut industry is available, isolated statements show clearly that it is not only large but that it fills a special need as a supplementary source of farm income.

A black walnut tree is decidedly pleasing to the eye. Fairly tall specimens are commonly seen along roadsides and on residential grounds where they have been planted for shade and ornamental effect. The leaves resemble those of the mountain ash, a tree known for decorative value.

Black walnut is regarded as one of the most valuable native forest trees of the United States. The superiority of its wood—sometimes referred to as "American" walnut—in color, texture, strength, ease of working, and resistance to destructive fungus and insect pests, early made it a favorite with American colonists. It was chosen in preference to most other woods in selecting material for buildings, furniture and interior decoration. For its sheer beauty and adaptability to many uses the wood has no peer among native species.

This fact has been a drawback to the nut crop in that the high returns from walnut lumber have brought about a serious diminution in the stand of nut-bearing trees. It is thought that of late years the supply of nuts may be increasing as horticulturists have been successful in selecting strains for larger yields of nuts. The walnut can be propagated rather easily, and in many sections of the Middle West and the South there has been consistent planting. It is native over the greater part of the eastern United States, but it thrives best on deep, rich, well-drained soil where there is plenty of moisture.

Perhaps the black walnut's greatest handicap, from the commercial point of view, lies in the fact that it is one

PHOTOGRAPH COURTESY U. S. FOREST SERVICE

GATHERING PINYONS

Navajo Indians in northeastern Arizona harvest the little but delicious "pine" nuts that form an important part of their diet. See the article beginning on page 445 for further information on these "nuts"

of the hardest nuts to crack. Even then, the extraction of half kernels intact is an operation requiring considerable skill. Yet, in spite of its handicaps, the nut's flavor and its nutritive value, whether whole or broken, have been responsible for the development of a going industry.

In 1900 the small amounts of black walnut kernels then found on the market brought only six or eight cents a pound. By 1927 the retail price had risen to from 50 to 75 cents a pound, although nuts in the shell can be bought much more cheaply.

Although a few cracking machines are in commercial use, the extraction of the kernels is still a hand operation performed, for the most part, by the farm family as a spare-time enterprise.

The Tennessee Valley territory produces from one and one-half to two million pounds of extracted kernels. Revenue to the inhabitants from this source probably averages at least $250,000 a year—double the amount they received in 1935 from the sale of walnut timber.

It is essential that black walnuts be harvested promptly after they fall from the trees, and the hulls removed soon after, so that the nuts can be spread out to dry lest the kernels become discolored and the flavor rank. The hulls may be removed with an ordinary corn sheller or with a vegetable-paring machine such as is now in general use at vegetable canneries, large hotels, and restaurants. With the aid of the latter, the hulling and washing are accomplished in one operation.

Some black walnut trees attain an unusually large size. One on Hanover Neck, New Jersey, having a circumference of twenty-four feet, is said to be among the largest individual hardwood trees. Another tree notable is the Pioneer Walnut at Salem, Oregon, planted in the pioneer days of the Oregon country.

A close relative of the black walnut is the butternut. The latter has the same type of hard, rough shell but differs in that it is oval in shape rather than round. This species has been greatly neglected by horticulturists. In addition to producing an excellent quality of nut, the butternut is the hardiest member of the walnut genus, its native range extending into southeastern Canada. It is abundantly worth development wherever it succeeds, especially in the North.

Large quantities are gathered for home consumption in the North and East, as many prefer butternuts to black walnuts, both for flavor and because of the greater ease in extracting the meat. Yet despite its richly flavored, oily kernels, the butternut is not an article of commerce, generally speaking.

Many a farm boy has pleasant memories of going nutting for hickory nuts in the fall. There are several species of hickories, but shagbark hickory is the most widely distributed, the most extensively cut, and, because of its characteristic bark and the value of its nuts, the best known.

Hickory is unrivaled for vehicle construction and for the handles of axes and other implements. In fact, hickory handles have been largely responsible for making the American axe favorably known throughout the world.

Sales of hickory nuts are local for the most part. Sonnets might well be written in praise of hickory nut cake, but here, again, is a nut that is hard to crack. For this reason many forgo such epicurean pleasures. Hickory nuts often sell for as little as $3 to $4 a bushel.

Among the smaller edible nuts on the market is the pinyon or "pine nut". Long a staple food of Indians, pinyons have become commercially important only in recent years. Strange as it may seem, Italy is indirectly responsible for the development of the modern pinyon market. Italian pignolias, similar to our native pine nuts, were formerly imported by immigrants to New York City from southern Europe. It remained for an easterner traveling in the Navajo Indian country some years ago to hit upon the idea of shipping a carload of pine nuts back to New York City, and since then many a carload has followed.

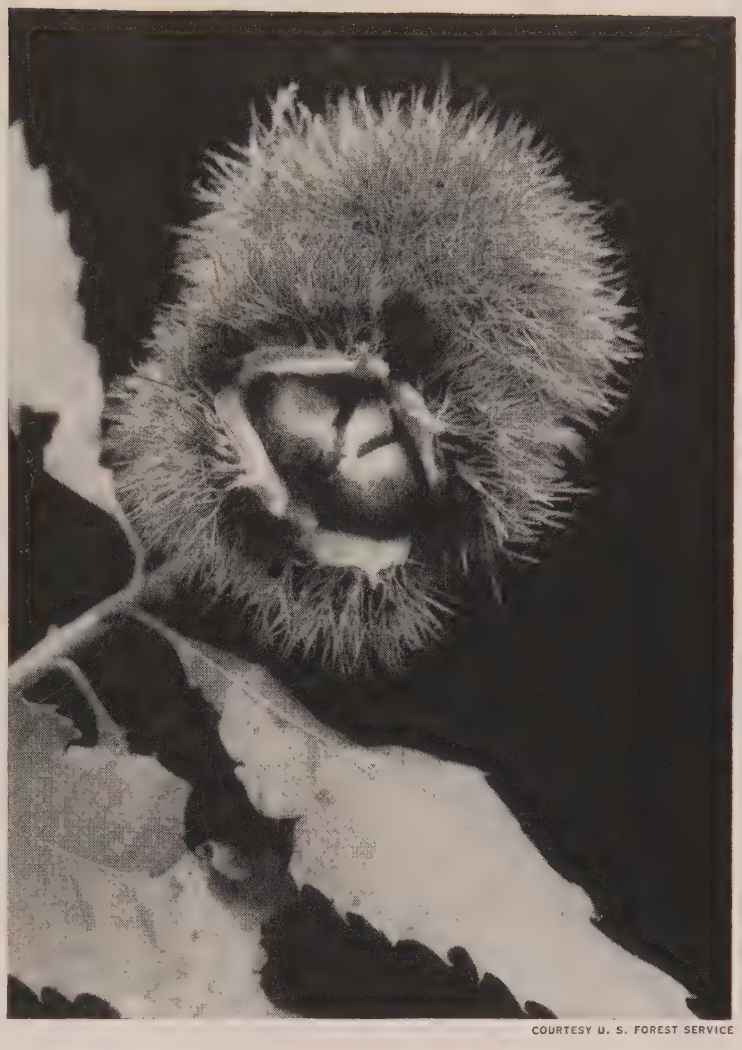
[These nuts are discussed at length in the article beginning on page 445 of this issue. Editor.]

In contrast to the growth of the pinyon market is the case of the beechnut, which is gathered only for home use and seldom sold. This nut was formerly eaten in great quantities by enormous flocks of the now extinct wild pigeons.

The beech tree is native to the eastern half of the United States. Its nut, which is sweet and oily, is about one-fourth to one-half inch long. Because of its small size and the

A NUT THAT IS NEARLY GONE

The blight has swept away our native chestnut trees, but there is a possibility of developing a strain resistant to blight



COURTESY U. S. FOREST SERVICE

dexterity required to extract the sweet kernel, it has not become commercially important. It is thought that improved varieties might have commercial importance.

The Brazil nut tree grows wild, flinging its large-leaved crest 150 feet or so into blazing blue tropical skies. The outer shell of the nut is of vegetable ivory, half an inch thick. Inside it lie from fifteen to twenty-four nuts, arranged like the sections of an orange. Technically, the Brazil nut is not a nut but a seed.

Shelled Brazil nuts imported in 1938 increased by nearly 700,000 pounds over the quantity imported the preceding year. There was an increase in imports of nearly eight million pounds of unshelled nuts during the same period. Brazil nuts are an excellent source of phosphorus.

Another import now found in nut shops is the pili nut, from a Philippine tree of the same name. The nut is delicious after it has been roasted.

Those who prefer chestnut dressing for stuffing fowl may yet be able to use native chestnuts for this purpose instead of the imported variety that has been on the market since the chestnut blight became widespread. The ravages of the blight have all but removed this fine American tree from the forests where it formerly ranged over much of the East.

For many years the Bureau of Plant Industry has been evaluating chestnut seedlings, sprouts and trees of American and European origin whose apparent resistance to the chestnut blight has been reported. It is possible that a blight-resistant American chestnut tree may be developed as a bud variation or a sport.

There are three species of hazel native to the United States. The western species is a shrub or small tree, and the two eastern species are both small shrubs. The latter are known as the American and "beaked" hazelnut, respectively. The beaked hazelnut is easily identified by a tube-like beak at the apex of the nut.

Children in the northern Lake States, where the climate is too cool for other nut trees to thrive, find great sport in gathering hazelnuts, peeling off the prickly outside covering, and cracking the shell with their teeth.

Although our native hazelnuts are rated as inferior in edibility by horticulturists, they have been used to some extent in breeding work. Thus, the humble hazelnut is distantly related to the filbert.

Six or more cultivated nuts are commonly found in nut shops of large cities in the United States. Some are grown in this country and others are imported. Domesticated nuts such as the English walnut are of great economic importance in the extensive cultivated-nut industry.

The commercial production of filberts is a young and rapidly expanding industry in the United States. Official estimates of production were not made before 1927. Oregon and Washington have the distinction of being the only states in which filberts are grown on a commercial scale. A detailed survey made in 1934 and 1935 showed approximately 850,000 trees in eighteen Oregon counties, and approximately 183,000 trees in thirteen Washington counties.

It would appear from the survey that plantings will result in a continued rapid increase in production up to 1945, provided no unforeseen development occurs, such as unusual weather or the appearance of a serious disease or pest. Of the trees standing in 1935, ninety-seven percent had been planted after 1919. From sixty tons in 1927, the first year official reports were made, United States production of the nut has increased to about 3500 tons in 1939. It is well within the realm of possibility that by 1945 a crop of 5000 tons or more may be produced.

With respect to volume of consumption, Persian (English) walnuts are by far the most important tree nut. The value of walnut exports increased to $1,684,081 in 1938 from $1,045,360 in 1937. In pounds, there was an increase of more than 2 million during the same years.

Native to western and central Asia, the tree was known

THE PEANUT IS NOT A NUT

This member of the pea family has, however, elbowed its way into the nut group and is the important source of many products as well as of great value as a farm crop

COURTESY U. S. BUREAU OF PLANT INDUSTRY

to the Greeks, who introduced it from Persia into Europe at an early day. Carried from Greece to Rome, it was thence distributed throughout continental Europe. It reached England prior to 1562, and it came to this country with the earliest settlers. In colonial days the term "English" was used to distinguish this walnut from the native American black walnut, since at that time the nuts were imported via England.

Formerly, almonds were consumed in the United States in greater quantities than any other tree-nut except walnuts. Almonds are now close rivals of Brazil nuts for fourth place. It may be noted, however, that almond consumption in the United States has been sufficiently high to absorb all of our domestic production, grown chiefly in California, plus a varying quantity of imports.

Pecan and cashew nuts compete closely for second place in point of consumption. Cashew nuts, practically unknown to United States consumers before 1928, have steadily grown in popularity since that time. It is estimated that United States consumers ate a little more than one-fifth of a pound of cashew nuts per person during 1938-39. Many nut shops report that their heaviest sales are in cashews. Walnuts are purchased chiefly at grocery stores.

Imports of cashew nuts increased by 1061 percent during the five-year period, 1934-39, and there was a decline in the consumption of walnuts, almonds and filberts during those years. The cashew family comprises about 450 species of trees and shrubs found mostly in the warmer regions of the world. India is the only country in the world that produces cashew nuts in commercially important quantities.

Imports of shelled pistachio nuts also increased during the past year; there was a slight decrease in imports of the unshelled nut.

Two beautiful specimens of the pistachio tree are now growing in the Cleveland National Forest, located in the southwestern corner of California, from seeds sent to the Department of Agriculture by the Chinese Government. The trees, which are about fifteen feet tall, are a mass of verdant foliage during the greater part of the year. In autumn, the leaves turn a brilliant red. Travelers on the highway passing the Oak Grove Valley Ranger's Station usually stop for several minutes to admire the bright coloring.

To all intents and purposes, peanuts are nuts although they are actually a member of the pea family. A native of the tropics, the peanut was known in North America in colonial days.

The peanut plant differs from the common garden pea in that it possesses the character of maturing its fruit, or pod, beneath the ground. Small yellow flowers are borne at the joints where the leaves are attached to the stems, and as soon as pollination takes place the flower fades and the "peg", as it is commonly called, elongates and descends into the soil where the pod develops. Hence, it is essential that the crop be grown on soil where a loose surface can be maintained.

Peanuts will adapt themselves to a wider range of climate, if soil conditions are favorable, than almost any other southern crop. They grow in Bermuda, Southeastern Canada, China, Cuba, Japan, the Netherlands Indies, Panama, and the Philippine Islands, as well as in the southern United States.

During the past few years the production of peanuts, gathered for nuts, has averaged about 1,300,000,000 pounds, which have been utilized roughly as follows: 40 percent for peanut butter; 20 to 25 percent for use in confectionery; 15 to 17 percent for peanut oil; and the remainder for salted nuts and other miscellaneous uses including peanuts sold in the shell, without which the ball parks and circuses would be in a sad way.

Peanut exports are increasing and so are imports of shelled peanuts. Imports of unshelled peanuts are decreasing.

Many nuts have by-products to their credit but the peanut probably leads all other nuts in the number of its by-products. To date more than (Continued on page 490)

Related species of milkweed pods, with their seeds attached to silky white and soft hairs, are perhaps the most familiar and spectacular of seed pods. Nature has provided milkweed seeds with the means to travel long distances on the fall breeze. The silken hairs are often used as a background for moth and butterfly mounts. This is a southwestern species of the interesting genus called *Asclepias*.

Flowering straw, a member of the chicory family, has a "blow ball" seed pod like a fairy pinwheel set atop brittle, leafless stems. The feathered seeds are ready for adventure and await the call of the wind to take them far and wide over hill and dale. The species pictured here is *Lygodesmia texana*, a native of the plains of Texas and New Mexico; other species are widespread in the West.

SOME PODS AND SEEDS

By JEWELL CASEY

Seeds get around. Nature has seen to that by providing a wide variety of means of travel. They include the clinging "beggar's lice" that stick to passing animals, or to humans, and seeds that float on turbulent wind or tossing wave to distant resting places to carry on their kind.

These seeds, the receptacles that bear them, and their modes of distribution, form a fascinating phase of the study of wild plants. Wanderings in field and forest with particular attention to Nature's way with these plants afford a wealth of interest. Too often we dismiss this phase of the life history of plants as something commonplace and uninteresting. Quite the contrary, it is a subject full of surprises; something one should not miss.

The photographs here were all taken in Texas and are of the seed pods of flowers, shrubs, trees and vines growing in that State. Many of them, however, occur elsewhere, and others have close relatives—with similar seeding habits—that are found widely distributed over the country. A similar photographic collection for any region would be an interesting project for the amateur botanist and Nature photographer.

Pods of Devil's horns are sticky when green, turning black when ripe and splitting lengthwise to form two horns. The rich, nut-like black seeds are pleasant to nibble on. The horns catch in the fur of animals, which carry the seeds with them. The scientific name is *Proboscidea*.

Prickly pear cactus *Opuntia lindheimeri,* is shown adorned with its reddish-purple fruit. These are sometimes eaten raw, and are made into preserves, candies and jellies. Usually thought of as a desert plant, this and related cactuses are really widespread in distribution, and are the most common of the cactuses.

The cow-tongue cactus, *Opuntia linguiformis,* is a rarer member of the family and a striking plant. It does not fruit freely, but in the picture here the reddish-purple, pear-shaped seed pods are well supplied with the means to carry on. The range of this cactus is limited, so far as is known, to the region of south Texas.

The poppy is the emblem of August, and means oblivion and forgetfulness. The silvery-green stems of this species, *Argemone alba,* as well as the foliage and pods, are prickly but interesting. The pods, when ripe, open at the top, turning backward to form three lips and making ready to release the seeds within.

Pipe vine, *Viorna coccinea,* is a member of the crowfoot family and has seed pods of outstanding interest. The curves and whorls of these pods form a striking picture amid the mass of glossy, heart-shaped leaves. Several members of this genus are found in the Rockies, and the higher southwest.

Shrubby trefoil, *Ptelea trifoliata*, or *crenulata*, belongs to the rue family and its seed pods are thin, flat, circular and petal-like, as well as delicately beautiful. When thoroughly dry the pods rustle pleasingly in the wind. It ranges west to California and is locally called hop-tree, or potato chips. One need only look to see the reason for this popular name.

Old man gray beard, *Clematis drummondi*, is a vine and a member of the crowfoot family. When massed against fences and shrubs, the long silvery plumes, which are attached to balls of small, flat seeds, make a striking picture. When a strong wind strikes a bower of ripe seeds an imitation snow storm results. Gathered before fully ripe, sprays of this vine are used for winter decoration.

Pokeberry, *Phytolacca americana*, is widespread in eastern United States. Long, gracefully drooping clusters of shining, dark, reddish-purple berries, hanging from red or purple stems, make a striking picture amid rich green leaves. The berries are eaten by a variety of birds and this helps their distribution. A local name is pigeon-berry.

Lance-leaved sumac, *Rhus lanceolata*, is a southwestern member of the family. This is a widespread plant offering attractive pyramidal clusters of small, dark red, hairy stone-fruits. These, in combination with the multi-colored leaves, make it one of our most pleasing shrubs. The birds enjoy the slightly acid fruit, and distribute its seeds in return for its help.

Scrambled eggs is one of the local names given to this southwestern member of the genus, *Corydalis curvisiliqua*. The name may be prosaic but there is nothing undistinguished about the long, four-angled, slightly-curved pods marked with red and green. This attractive and odd pod splits down the middle when ripe and emits many small seeds. The plant has a golden-yellow flower blooming in a spike-like raceme.

Eve's necklace, *Sophora affinis*, is an interesting plant belonging to the pea family. It is particularly distinguished for its pods, which are conspicuously banded, long, black and constricted between each seed. The seeds are a rich, dark brown and make lovely beads. Holes for stringing them may easily be punched in the seeds before they are fully ripe. Other species are found in the southwest and in the western plains region.

Bald cypress, *Taxodium distichum*, one of the most beautiful and valuable of our trees, is native to the swamps of our southeastern States. Its leaf sprays of pea-green turn to orange-brown, and are tipped by clusters of blue-green globular cones. They are, therefore, notably decorative. The wood is sought for many purposes where permanence is sought, for it is considered one of the most durable of all species.

Mexican buck-eye, *Ungnadia speciosa*, a member of the soapberry family, produces a highly-polished mahogany-colored nut that is good to look at but not good to eat. The fawn-colored, three-lobed, leathery pod is attractive and old-time Texans will tell you that one carried in the pocket is good for "rheumatiz". This tree extends into Texas and southern New Mexico. It is named for Baron Ungnad, who introduced the horse chestnut to Europe.

NUT PINE, CHINQUAPIN AND CHESTNUT

"Nuts"

The eleventh in Nature Magazine's series of Educational inserts

By E. LAURENCE PALMER

IN MANY cities one now finds stores that sell nothing but "nuts". Few people, however, know much about the plants that produce these delicacies, the parts of the world from which they come; the rise or fall in prosperity associated with their production, or of the uses other than food to which these plants, and the "nuts" themselves, are put. Materials for study should easily be obtainable by all. The species covered in this feature include all of those kinds commonly included in the "mixed nuts" of the grocery store, the "blanched nuts" of the delicatessen or drug store, and the "nickel a bag" nuts of the circus, ball park or street stand.

A number of plants included in this selection are not considered by the botanist as producing nuts. To students of plants, the horse chestnut is a seed; the peanut is a pod, and the shelled peanuts are seeds. The peanut plant differs from the others here considered in being non-woody.

What is a Nut?

Technically, a nut is a hard, bony, one-seeded fruit. By this measure, the butternuts, hickory nuts, walnuts and almonds would not be nuts because of the spongy husk that surrounds them. All of these would be "drupes" rather than true nuts, while the acorns of the oaks, and the fruits of chestnuts, beeches and chinquapins fit the

BEECH, BUTTERNUT AND PECAN

SHAGBARK HICKORY, ENGLISH WALNUT AND BLACK WALNUT

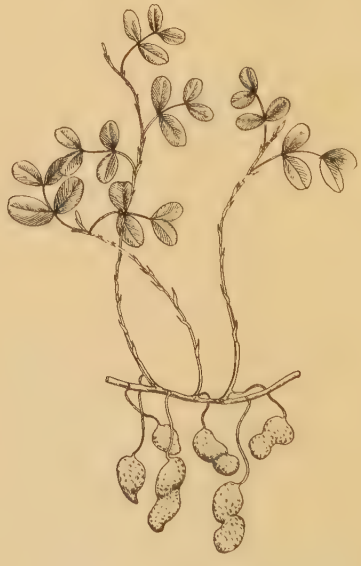
definition satisfactorily in the accurate sense of the word.

It is rather hopeless to look to the political or the legal profession for definitions in the field of natural history. A glimpse at what these professions recognize as fish should guarantee the truth of this statement. There are reported to be cases, however, of persons being prosecuted for leaving peanuts exposed for sale, on the ground that they were fruits, and local ordinances forbade leaving fruits so exposed. One who tried to apply a policy of "truth in advertising" to the average nut store could force the salesman to remove from his shelves most of the things that are to be found there. In a strict sense, the average "nut store" might better be called a "seed store", although it is doubtful if such advertisement would attract customers. The item that most truly can be called nuts might be the "mixed nuts" of the grocery store. Yet if one studied such a mixture critically it would be found that the Brazil nut would have to be put out because they were seeds; the almonds because they were drupes; the pecans because they represent only a portion of the fruit.

The Geography of Nuts

A glance through the charts of this insert will show that there is a geography of nuts. It ranges from the tropical requirements of the Brazil-nuts, cashews and coconuts, through the subtropic and subtemperate pecans, English walnuts, filberts, almonds, pistachios and peanuts, and up to the more cold-enduring chestnuts, oaks, hazels, black walnuts, and butternuts. We can look in vain for many important nut plants in the colder parts of the world.

Thus, in a broad sense, agriculture and the industries dependent upon nuts are localized. Such distribution also helps define the range of many of the wild animals that depend largely upon nuts for their food, and which they may store to tide them through the more severe winter



COAST LIVE OAK, PEANUT AND BEAKED HAZEL NUT, WITH FILBERT

BRAZIL-NUT, COCONUT PALM, AND ALMOND

weather. Such associations in Nature are interesting.

Copra, the dried meat of coconuts, may, with sugar, be considered among staple products of the tropics that enable people of these warmer parts of the world to purchase the things they need from sources in the temperate zones. In the dried form, copra may be shipped long distances more easily, cheaply and with less necessary rapidity than can bananas, pineapples and citrus fruits. Moreover, it is doubtful that the production of copra will ever completely satisfy the demands that the findings of chemical research will put on it as a basic organic substance. Through the medium of this nut, at least, it will long be necessary that friendly trade relationships be continued between widely separated parts of the earth. This, of course, is to be desired.

Nuts as Food

We shall always think of nuts essentially as sources of food, but how do they compare with other foods and under what circumstances are they superior or inferior to other kinds of nourishment? One cannot safely live solely on nuts, but there may be times when their use may greatly reduce the necessity of transporting, over a difficult terrain, more bulky foods.

It is easy to conceive of ten tablespoonfuls of corn flakes, of eight ounces of beef or chicken broth, or two slices of rye bread, one egg, five ounces of milk, one pat of butter, one large apple or one strip of bacon. But what would it take to equal each of these in food value if one had to depend upon nuts as a source? Briefly, any of the above could be duplicated with portions of ten almonds, or two tablespoonfuls of hickory nut meats, or twelve peanuts, or ten pecans, or ten English walnuts. Obviously, on a hike, one could carry the nut portions more safely and with less danger of spoiling than would be true of the eggs, the butter, the bacon, or the milk. This comparison refers to the heat or energy units produced by the different foods mentioned.

Nuts also enter into the bal- (Continued on page 468)

PISTACHIO, CASHEW, AND HORSE CHESTNUT

COMMON NAME SCIENTIFIC NAME	NUT PINE *Pinus edulis*	CHINQUAPIN *Castanea pumila* OTHER CHESTNUTS	AMERICAN CHESTNUT *Castanea dentata*	AMERICAN BEECH *Fagus grandifolia*
DESCRIPTION	Tree, to 40, but more commonly 20 feet high, with horizontal, bushy branches when young; low and round-topped when old. Needles, 2 or 3, rigid, dark green, ¾ to 1½ inches long. Branchlets, light yellow-brown. Whole plant almost bush-like in northern part of range.	Chinquapin is a native shrub or small tree with leaves whitish-downy beneath. Other chestnuts include the European chestnut, the Japanese, the Chinese, and the golden Chinquapin, *Castanopsis*, together with many varieties developed by orchardists.	Tree, 60 to 100 feet high. Old bark, gray and with long, coarse furrows. Leaves, short-stalked, alternate, 2 to 3 times as long as broad, veined. Twigs, medium, brown, with short, compact, few-scaled buds and broad leaf-scars. Roots, relatively deep.	Tree up to 75 feet high. Trunk, up to 4 feet through. Bark, smooth, close, gray, beautiful. Leaves alternate, pointed at each end, often persistent into winter in young trees. Twigs, moderately coarse with spreading, slender, long, pointed buds. Roots spreading, giving rise to shoots.
RANGE	Colorado to New Mexico and Texas, though may be planted and prove hardy as far north as Massachusetts. One ornamental variety has white leaves mixed in with the green. Normally found on dry hills and slopes within its range.	Chinquapin is native of region from New Jersey to Indiana and southward. *Castanopsis chrysophylla* is an evergreen tree of Pacific coast. Other species mentioned above are located by their names.	On hillsides, even on relatively poor but well-drained soil, and commonly associated with beech, maple and similar trees. Southern Ontario to northern Georgia, Mississippi and Michigan, but practically gone east of the mountains except as suckers and seedlings.	Rich, highland woods from New Brunswick to Virginia and west to Minnesota and Texas, sometimes forming an almost clear stand because of trees springing from roots. The related beech of northern Europe closely resembles American species.
CLASSIFICATION AND REPRODUCTION	Family Pinaceae with the spruces and firs. Order Coniferales. Cones, almost stemless, greenish yellow, shining, about 1½ inches long, with scales strongly-keeled or ridged. Seeds, about ½ inch long with a narrow wing that remains attached to the scale when separation takes place. Seeds, sweet and very edible. Pollination, by wind.	Family Fagaceae, with the oaks and beeches. Order Fagales. Nuts sprout soon after they fall in autumn. Because of this, do not thrive in North since wood cannot set before severe weather. Chinquapin, in general, is like chestnut but is more resistant to blight. Has been hybridized with chestnut.	Family, Fagaceae, with the beeches and oaks. Order Fagales. Flowers appear in late spring after the leaves, the staminate in loose yellow catkins. Pollination, by wind; fruits enclosed in spiny burs maturing by fall. Nuts; sweet and borne on younger wood than staminate flowers. Nuts germinate following spring if planted.	Family Fagaceae, with the oaks and chestnuts. Order Fagales. Trees begin bearing fruit relatively late, sometimes not until 13 years old. Pollination, by wind from ball-like cluster of staminate flowers to terminal pistillate flowers. Nuts freed in fall and germinate in late fall or spring.
ECOLOGY AND WOOD	*P. edulis* normally distributed at altitudes between 5000 and 9000 feet. *P. parryana*, another nut pine, or pinyon pine, from 3500 to 6000 feet. *P. monophylla*, Single-leaf pinyon, from 2000 to 7000 feet and *P. cembroides*, Mexican pinyon, from 4500 to 7500 feet. All are nut pines.	Do not reach great size or age of chestnut so have much less value as wood producers. Nuts are smaller and, while sweet, are badly infested with a nut weevil, particularly in the South. Short-lived nature, with smallness of fruits, makes them less desirable than chestnut except for blight-resistant qualities.	Wood, relatively coarse but uniform, strong, light and easily split; used in general construction work and withstands weathering well. Becoming scarce because trees have for most part been killed by fungus *Endothia parasitica*—chestnut blight. Also is attacked by a leaf spot disease. Was formerly budded and grafted for improvement.	Wood, hard, strong, durable, uniform, but does not withstand weather well; weighs 42 pounds per cubic foot and is used freely in furniture, tools, charcoal and fuel. Trees are susceptible to a leaf blight and to a bark disease, and nuts are commonly badly infested with an insect parasite. Trees are not always easily transplanted.
ECONOMIC IMPORTANCE	Nuts of these pines highly important to Indians as food. May be collected by pack-rats and the rats' stores robbed by man. The nuts are sometimes found in the eastern markets. European nut pines, "Pinocchi" of Italy, are used in cakes and puddings, or as delicacies, but have strong turpentine flavor.	European chestnut highly susceptible to blight. Japanese chestnuts too coarse to be popular. Chinese, of superior quality and relatively blight-resistant. Chestnuts, used as flour in bread or in stuffing fowls, are too good to be lost entirely to man. Chinquapin, or some other chestnut hybridized with American chestnut, may solve problem. Hybrids of chinquapin and Chinese or Japanese chestnut are blight-resistant.	Both nuts and wood had commercial value, the former being harvested and stored, or roasted, or boiled. A meal made from nuts was used by Indians and early settlers, and wood provided interior trim and heavy construction in many of older buildings of its range. Blight-resistant varieties may be discovered, or hybrids developed to save.	The wood makes trees valuable, as do ornamental properties. Nuts, where abundant, provide excellent food for hogs, poultry and humans. They may be crushed and the oil extracted for use in cooking, or in food for many animals. The flavor of nuts is a standard of perfection to many people.

BUTTERNUT *Juglans cinerea*	PECAN *Carya illinoensis*	SHAGBARK HICKORY *Carya ovata*	ENGLISH WALNUT *Juglans regia*	BLACK WALNUT *Juglans nigra*
Tree, to 100 feet high. Bark, gray with long, waving furrows as contrasted with shorter units of black walnut. Leaves, compound, 11 to 19 leaflets, rather sticky and alternate, leaving large, 3-lobed leaf scars. Twigs, coarse with pith cross-walled. Deep taproot.	Tree, to 150 feet high. Leaves, compound, with 9 to 17 leaflets, each tapering gradually to a slender point, minutely downy at first but becoming smooth. Bark, smoother than in most hickories. Roots, deep. Twigs, coarse with broad leaf-scars. Pith not partitioned.	Tree, up to 120 feet high, with gray bark which strips off in long, loose, irregular pieces. General shape, cylindrical. Leaves, alternate, compound, of 5 to 7, stalkless leaflets, each pointed at ends. Roots, deep. Twigs coarse, with large, loose-scaled, hairy terminal buds.	Tree, to 70 feet high. Leaves, alternate, compound, of 5 to 13 leaflets, almost smooth, bright green, with leaflets, 2 to 5 inches long. Twigs, relatively coarse. Leaf-scars, broad. Buds, conspicuous. Bark, roughened.	Tree, to 75 feet tall. Trunk, to 8 feet through. Bark, evenly roughened into squarish units; dark. Leaves, alternate, compound of 15 to 23 leaflets pointed at end, heart-shaped at base, downy beneath. Roots, deep. Twigs, coarse. Buds and leaf scars, shorter than in butternut. Pith, with cross plates.
In well-watered woodlands or uplands preferably on neutral soils but doing better on sour soils than most other nut trees. New Brunswick to the Dakotas and south to Georgia and Arkansas. Requires reasonably good drainage; will withstand more severe conditions than black walnut or most other nut trees. Never in pure stands.	Cannot survive or ripen nuts where growing season is under 150 days and where summers are not warm enough. This limits commercial pecan raising to the South. Indiana to Georgia, Texas and eastern Kansas is chief range. Do best in lowlands such as river bottoms.	On hillsides and in mixed forests where soil may be rocky but well-drained. From St. Lawrence River to Florida, Texas and Minnesota except along southeastern coast. Requires warm summer and long season to mature fruits. At least 15 northern varieties recognized in nursery catalogs.	Cosmopolitan species, cultivated in United States in Oregon and California; grows in East from Pennsylvania to Georgia. Though tree can survive more severe climates, does not there bear well. Large plantations have been established in various parts of World. Europe, China.	Rich lowlands and river bottoms, doing well where there is good sun and about 150 growing days to season, with average temperature of 62° F. Massachusetts to Florida and west to Minnesota and Texas. Do best in slightly alkaline soils. Thinner-shelled varieties being developed by horticulturists.
Family Juglandaceae. Order Juglandales, with the hickories. Stamens and pistils in separate flowers on the same plant; former in catkins near ends of branches. Pollinated by wind. Fruits, nuts about twice as long as thick, covered with spongy husks and hard shells; mature first year; germinate following spring if buried about 2 inches.	Family Juglandaceae. Order Juglandales, with walnuts. Pistillate flowers that produce fruits may not be formed in buds until 12 weeks of growing season have elapsed; as a result, flowers may be prevented from forming in North even though trees may grow. Pollination, by wind. Nuts should be planted 2 inches deep and 4 inches apart.	Family Juglandaceae. Order Juglandales, with the walnuts. Staminate flowers in catkins at base of season's shoot; pistillate flowers, at the tip. Pollination by wind. Nuts, maturing in fall, surrounded by a thick husk that splits to free delicious nuts weighing about 90 to the pound; 50 to 75% germination. May live 300 years.	Family Juglandaceae, with hickories. Order Juglandales. Staminate and pistillate flowers, in separate clusters on same tree; latter, borne at ends of year's growth and producing nuts enclosed in relatively thin husks, technically drupes. Seedlings, normally transplanted when two years old.	Family Juglandaceae. Order Juglandales, with hickories. Stamens and pistils in different flowers on one tree, appearing before leaves. Nuts weigh 34 to pound, with 75-80 percent germination, often delayed to several years. Should be planted 1½ inches deep, 3 to 6 inches apart. Seedling, 6 to 36 inches first year; mature at about 150 years, but may live 250.
Trees rarely live more than 75 years; attacked by slow-growing fungus, sometimes taking twenty years to cause death. Fruits weigh 16 to the pound, ordinarily germinate 75 percent and should be husked before stored; should be planted permanently rather than transplanted, in early spring; in one year, should reach height of 10 to 18 inches.	Wood, hard, durable but plant may be easily winter-killed because of lateness of maturity of terminal buds. Seedlings and grafts may be bought for starting a plantation. Seedlings for transplanting should be reset every two or three years to develop proper mass of roots. This seems to lead to earlier fruiting habit.	Wood, exceptionally hard, tough, strong, heavy and flexible; therefore used in making wagon spokes, axe handles, baskets. Leaves may bear a mildew; the twigs, a witches' broom disease; the wood, a white rot. One of our strongest woods and also one of our best firewoods. Not good city ornamental because of litter of bark and fruits.	Wood, a valuable furniture and interior finish product known as French, Turkish, Italian or Circassian walnut. Fruit known in commerce sometimes as Persian walnut. Wood is durable, lighter than black walnut in color and weight. Important timber tree, particularly in India where it reaches great size.	Wood, heavy, strong, rich, not easily split, durable, 36 pounds per cubic foot. Relatively free from insect and fungus enemies, but have a tent caterpillar and a red butt-rot. Relatively fast growing trees whose fruits are favored by squirrels, and whose wood is more valuable than that of its associates. Dye obtained from bark.
Wood, known as white walnut, softer, less durable, lighter in color and weight than black walnut, but used in furniture. Sap is sweet and often added to maple sap in making sugar. Young fruits are pickled—as "pickled oil nuts"—in vinegar, sugar and spice. A dye was extracted from husks and inner bark; used in dyeing cloth until about 1860. Roots, used medicinally.	In *1937,* 81,093,000 pounds of pecan nuts were sold in United States at total value of $5,941,000 to farmers. In *1926,* there were 95,861,000 pounds produced, for $14,964,000. Read Stuckey and Kyle, *Pecan Growing,* Macmillan, and state and government bulletins. Nuts provide labor for many persons; crushed, make superior hog fodder.	A sweet gum made from sap. Mixture of bark and glucose tastes like maple sugar. Nuts have commercial value, though not great, and attract squirrels that may be valuable game or interesting neighbors. Probably trees are not developed as rapidly as they are destroyed for fuel and lumber.	Nuts are valuable as food. While United States imported in *1911,* 37,214,000 pounds of nut meats, this dropped to 4,980,000 in *1936,* probably largely because of local production competition. In *1935,* we imported about 3½ million pounds from China; ½ million from France, and remainder from Italy and other countries.	Nuts sell from $1 to $4 a bushel, or meats at 72 cents per pound for use in candy. Wood so valuable it is being used largely in making of veneers, fine furniture, gun stocks. Can be cultivated with profit in upper Ohio Valley region, Missouri and southern Iowa. Tomatoes and some other crops do not thrive near walnuts. See Farmers Bulletin 1392, U. S. Dept. of Agriculture.

COMMON NAME SCIENTIFIC NAME	COAST LIVE OAK *Quercus agrifolia*	PEANUT *Arachis hypogaea*	BEAKED HAZEL *Corylus rostrata*	BRAZIL-NUT *Bertholletia excelsa*
DESCRIPTION	Forest trees growing to 90 feet. Trunk diameter, to 6 feet, the trunk generally dividing low into crooked heavy branches. Leaves, stay on for 1 year; 1 to 4 inches long, oval, rather coarse and heavy. Twigs, hoary for 2 seasons. Bark, brown to black and deep-furrowed.	Technically, not a nut. About 1 foot high, with rich, green leaves, of 2 pairs of leaflets and no tendril, pinnately arranged. Two plant-types recognized, a vine and the bunch-nut type, of which the Spanish and the Valencia are popular varieties.	The beaked hazel figured is a low tree or shrub, with alternate leaves and "beaked" fruits. The twigs are not bristly as in the American hazel. The filbert of commerce is a small tree with a number of varieties, including Barcelona, DuChilly, Alpha, Daviana and Clackamas. See lower fruit in illustration.	Tree, from 100 to 150 feet high. Trunk, to 4 feet in diameter. Bark, smooth. Branches, high. Leaves, alternate, about 2 feet long, and 6 inches wide, bright green. Also known as Nigger-toe, Butternut, Cream-nut, Para-nut.
RANGE	Dry loams or gravelly soils of open slopes from sea-level to 4500 feet elevation from San Francisco south to Lower California and rarely more than 50 miles from coast. If near salt water and exposed, become more shrubby in appearance.	Will grow as far north as New York, but not commercially successful much above Virginia. Eight of nine species of the genus are Brazilian. Commonly cultivated in sub-tropic countries where summers are long enough to permit ripening of the fruits. Also may be grown in greenhouses.	Beaked hazel ranges from Quebec to British Columbia and south to Missouri and the mountains of Georgia. The region where filberts are raised most in America is in Washington and Oregon. They winter-kill at 0° F. and fruit buds are injured at below 12° F.	Found in great forests, largely along the banks of the Amazon and the Rio Negro in South America, but is not grown in the open anywhere in the United States.
CLASSIFICATION AND REPRODUCTION	Family Fagaceae. Order Fagales. Flowers appear in early spring. Pollination, by wind. Fruits maturing in one year into acorns 1 inch long, with cup over the lower ¼ or ½ the nut, having silky, closely-pressed scales. Seedlings may develop under moderate cover, and, while growth is not rapid, maturity may be reached in 150 years.	Family Leguminosae, with the peas. Order Rosales. Flowers, yellow, in close spikes of 1 to 3 flowers. These first are above ground and immature fruit is enclosed in the calyx; the flowers are then thrust underground by the plant, and reach maturity there. When fully developed, vines bearing fruits are pulled and dried.	Family Betulaceae, with the birches. Order Fagales. Staminate flowers, in long, yellow catkins, open short time; pistillate, in short, red-tipped clusters, open long time (4 to 6 weeks). Pollination, by wind. In orchards, Barcelona commonly pollinated with White Avelina, Daviana or DuChilly. Fruits mature in late summer or fall.	Family Myrtaceae. Order Myrtales, which includes evening primroses. Flowers, cream-colored with calyx parts united but tearing into two parts when flower opens. Petals, 6. Stamens, many. Fruit, about 6 inches across, with hard, thick shell containing 18 to 24 three-sided nuts.
ECOLOGY AND WOOD	Trees, often found in almost pure stands, alone in the open or mixed with other trees. May be associated with California sycamore, big-cone spruce and white alder. Trees are too distorted to produce any great amount of clear lumber, but they produce great quantities of acorns.	Plants cannot survive a frost, and if tops are to be used for feeding they should be harvested in time to avoid this. Peanuts are grown in crop rotation to add nitrogenous substances to the soil, as a forage for hogs, as a food for man, or as interesting plants in greenhouses. They are high in food value for their fats and oils.	Wood, of little value, but trees and shrubs are used in landscape work. Filberts, from hybrids of Eurasian species of *Corylus*, do best on average bottomlands. They do not thrive on poor lands. Hazel stems formerly supposed to serve as divining rods to locate water. Plants easily pruned and grafted and may thus be improved for fruit production.	Trees are not attractive nor hardy enough to be used as ornamentals. Bark used in calking ships, chiefly at Para.
ECONOMIC IMPORTANCE	Acorns of this and of some other oaks, including swamp white oak, chestnut oak, basket oak, and white oak are edible. Indians, especially in west, ground the meat, either before or after roasting, and sometimes removed tannin by soaking in water. From this, flour cakes were made which, according to John Muir, were most valuable food for hiking trips.	In *1935*, ⅔ of all "nuts" consumed in America were peanuts. High year of importation was *1919* when 128,390,000 pounds were brought in; in *1936*, 1,500,000, a low, were imported. Nuts are used in making special butters, oils and plastics. They are roasted for direct consumption and treated chemically to provide a host of different products. One of the South's most important crops.	In *1932*, United States consumed 13,000,000 pounds of filberts, only 1,000,000 of which were raised locally. Yields of 3000 pounds per acre possible, but 1000 more normal. Production costs average under 14 cents per pound. ⅕ current cash. In *1937*, Oregon produced 2230 short tons, worth to farmer producers, $479,000. Imports, mostly from Europe.	Nuts, collected by natives and exported. In *1929*, United States imported more than 20 million pounds, mostly unshelled. Recent high year was *1935-36*, when more than 32 million pounds were imported, about ⅔ being in shells. Oil is extracted from nuts by pressure and finds various uses, particularly by watchmakers and artists.

COCONUT PALM *Cocos nucifera*	ALMOND *Prunis communis*	PISTACHIO *Pistacia vera*	CASHEW *Anacardium occidentale*	HORSE CHESTNUT *Aesculus hippocastanum*
Tree, 50 to 100 feet high, or much smaller. Leaves, pinnately compound and to 20 feet long, springing from a common head or restricted area. Trunk, tough and fibrous, often curved, and diminishing in diameter to the head. Bark, rough and fibrous.	Trees, to 25 feet tall. Bark, gray, bitter. Leaves, alternate, shining, firm, with margins finely uneven. Commonly cultivated and developed by grafting on suitable root systems of related plants.	Tree, to 30 feet high, with spreading branches. Leaves, at first fuzzy, then smooth, pinnately compound, alternate, of 7 to 15 leaflets, though one cultivated variety has only 3 to 5 leaflets; leaflets, stemless. Bark of young twigs, brown to rusty.	Tree, to 40 feet high. Leaves, oval, rounded, pinnately veined, evergreen, alternate, very susceptible to frost. Juice, milky, but hardening to a gum, like gum arabic when exposed to the air. Known also as cadju or acajou.	Tree, to 90 feet high. Bark, roughly scaly. Twigs, coarse. Buds, sticky and large. Leaf-scars, broad and conspicuous. Leaves, opposite, palmately compound, of 5 to 9 leaflets, broadest near tips and with irregular margins. Trees, often irregular because of winterkill and disease.
Probably originally from America but widely spread by man early in history. Require mean annual temperature above 72° F., and unless underground water is available, must have at least 40 inches annual rainfall. Found in California and Florida in United States, and in Tropics generally, near coast.	Cannot survive early fall or late spring frosts, and are therefore limited somewhat more than are peaches. Cultivated in America most commonly on Pacific Coast, where they have been grown for more than half a century. More tolerant of drought than most fruit trees, but roots will not survive standing water. Do best in light soils.	Native of the Mediterranean and western Asiatic regions with a close relative, *P. mexicana,* found in Mexico and southern California. Should be hardy in southern United States. Has long figured in human history.	Native of tropical America, particularly the West Indies, and may survive climatic conditions in southern Florida. Widely cultivated in the tropics, or grown in greenhouses as a curiosity.	Best in well-drained, loose, rich soil. Originally, this species was a native of Asia, but it has been planted world-wide as a shade and street tree. The American species, called buckeye, are essentially of the upper Ohio and Allegheny highland region.
Family Palmaceae. Order Palmales. Flowers, borne at head of tree beginning at 4 years in some, but more commonly from 7 to 10 years. Flowers, club-like spathes, white or yellow; staminate having 6 stamens, and pistillate producing one-seeded fruits. Fruits may float in water and thus be distributed.	Family Rosaceae, with the roses. Order Rosales. One of earliest flowering of fruit trees; in California, blossoming in February. Bitter almonds are white-flowered; sweet almonds, pink-flowered. Propagation mostly by budding and grafting, trees being kept compact in warm regions and open in cooler. Over twenty-five varieties in California.	Family Anacardiaceae, with the sumacs. Order Sapindales. Flowers, brownish-green, in loose panicles, which develop reddish, wrinkled, 1-inch, drupes or double-shelled nuts, the outer shell being red, and the inner smooth and brittle. Kernel varies from pale green to cream yellow, and is rich, oily and sweet tasting.	Family Anacardiaceae, with the sumacs. Order Sapindales. Flowers, fragrant, rose-tinted, in clusters at ends of young branches, producing 3-inch white, yellow or red, sweet-sour, edible cashew apple; crowned by the 1-inch, curled nut. Nut, enclosed in 2-layer leathery, oily, acrid covering.	Family Sapindaceae, near the maples. Order Sapindales. Flowers, in large, terminal clusters, in late spring or early summer, appearing white, spotted with purple and yellow; showy but not long persistent. Insect-pollinated. Fruits developing as coarse, weak-skinned spheres, enclosing 3 large, shiny seeds, which are shed when ripe.
May tolerate salt water and may withstand drought, though latter may affect crop for a year or more. Tough fibers of trunk, up to 20% elastic and used in making "coir" of commerce. Have a number of insect and fungus pests, including a scale, a beetle; also rats and certain crustacea. Nut-sizes vary from 3300 to 7100 to produce ton of copra.	Wood, hard but not valuable compared to nut. In dry weather, the hulls open normally, freeing nuts. Sulphur used in removing stains. Bitter almonds are raised for extraction of prussic acid. Sweet varieties include those which are thin-shelled, and those which are hard-shelled. In better of these, ¾ weight may be edible meats.	The related *P. terebinthus* is the Cyprus turpentine tree; *P. lentiscus* of Smyrna is the mastic, producer of a gum used in varnish and for chewing, the latter procured by slashing the bark and collecting the extruded gum.	Obviously not hardy in severe climate. Oil driven from cashew apple by heat is highly irritant to skin and eyes. Nuts when roasted are, as is well known, delicious, but may yield, if crushed, an oil valuable in cooking and, in many respects equal of high quality olive oil. May be grown from cuttings of mature wood that bear leaves.	Wood, uniform, hard, white and reasonably durable, but does not weather well. The trees were introduced into Europe from Asia more than 300 years ago. The seeds have the appearance of being edible, but contain a narcotic substance, which, unless removed, makes them of no food value to man.
Liquor from flower cluster fermented to produce a toddy or sugar, vinegar or yeast. Copra, greatest product used as food by man and beast, as soap, as lubricant and otherwise. United States imported in *1912* a low of 34,268,000 pounds of copra and in *1933* a high of 653,187,000 pounds. *1936* yield, 405,784,000 pounds. Copra is dried coconut meats.	In *1936,* United States imported 11,441,000 pounds of almonds, chiefly from Italy, with Spain and France following. Used largely as food. Sweet almonds yield 44 to 55% oil; bitter, 35 to 45% oil. Oil is used in cosmetics and with drugs. The Rod of Aaron was supposed to be from an almond tree, and Jews carry almond rods on certain festivals.	Pistachios are not cultivated in the United States. Instead, in *1936-37,* we imported 3,207,000 pounds, ⅔ coming from British Indies, ¼ from Syria and the remainder from Iran, Italy, and other countries. Reputed to have been sent by Jacob into Egypt, and has been grown and naturalized in Palestine for centuries.	A fermented and distilled beverage is made from cashew apple in Brazil and West Indies. Gum from juice used in varnish to resist termites and other insects. United States imported products of this American plant largely from British Indies at rate of 3,277,000 pounds in *1929-30* and 25,721,000 pounds in *1936-37.*	It is believed that the prefix "horse" was derived from practice of the Turks to feed seeds to horses afflicted with a cough, or being wind-broken. They have been fed to cows to increase flow of milk; have been used by book binderies for making a paste, and, treated chemically, to produce certain acids and alcohols, but not on a commercial basis.

(Continued from page 463) anced diet as appetizers and as sources of vitamin B. The disease beri-beri may result where this vitamin is absent from the diet. While it may be taken in a variety of foods, it is well represented in peanuts, Brazil-nuts, chestnuts, almonds and pecans.

The oils extracted from many nuts, as indicated in the charts, provide superior cooking oils of high nutritive value. A generous proportion of the "nut butters" comes from plant parts that are either technically or popularly known as nuts.

Other Products of Nut-bearing Plants

The plants that supply nuts of food value often make other valuable returns. The wood of walnut, chestnut, beech, hickory and some others may be considered among the more valuable lumbers of the regions in which they grow. This, in general, seems to be more true of the nut producers of the temperate zones than of those of the tropics.

Coconuts, hickories, cashews and some other nuts produce, by various techniques, liquors of an intoxicating or refreshing nature. In fact, the name hickory was derived from one of these liquors. Dyes come from the bark and other parts of the walnuts and hickories; lubrication oil from Brazil-nuts; chewing gum from pistachios; fibers of unique natures from coconuts and Brazil-nuts; varnish from cashews. Filters for gas masks used in war may come from nut products, and some of the acids used in manufacturing explosives are derived from certain nuts. When we consider what chemists have done with peanuts, we can just about let our imaginations go as far as we like, for they give us textiles, a great variety of plastics, foods of many forms, fuels, and so on. The peanut shucks, sweetened with molasses, cooked and properly crumbled, provide the basis for some breakfast foods, and the plants themselves serve to help in crop rotation and in maintaining the productiveness of farm soils. The peanut has been the salvation of much of the cotton belt when the boll weevil (in part) wrecked the single-crop farm philosophy.

When considering these by-products of nut-producing plants, we should not overlook the rôle some nut trees have played as shade trees and as ornamentals. An almond tree in bloom is a thing of beauty as well as a potential source of income. A hillside covered with chestnuts in bloom in late spring is a sight enjoyed by many of a generation ago, and one that may be denied to those of the future. And these trees not only titillate our vision with pleasant things, but the nuts themselves, like the beechnuts, set standards of taste that some of us think put them beyond any serious competition from other food items.

Nut Culture

The culture of nuts for commercial purposes is widespread, and most of the regions of the United States have agricultural experiment stations that issue bulletins dealing with the problems of raising the appropriate local species. The essence of many of the bulletins has been presented in the life history charts. Anyone interested in the raising of nut plants for profit should seek information from the Federal government in Washington and from the nearest agricultural experiment station.

The summaries of exports and imports of the various species may give some index of the degree to which our national needs are met locally, and some idea as to the probability of local competition making nut culture unprofitable. However, it must be recognized that new uses of nuts are being developed constantly and the future may be even brighter than the records of the past indicate. It has been said with some reason that, even in the North, a man fifty years old who had some steady source of income might set out a goodly number of black walnut trees with reasonable assurance that he would live to see them begin to earn their keep. There is every reason to expect that they would be valuable to more than one succeeding generation.

The techniques of handling nut trees are considered in most manuals dealing with agricultural practices. These include tricks of budding and grafting, of controlling insect and fungus pests, activities involving harvesting problems, and the preparation of the harvested nuts so that they may bring a maximum price in the market.

The nut industry provides considerable employment of the year-round nature when one considers the uses made of nuts. The trees may be cared for at times of the year when other agricultural activities are at a minimum. The crops may be harvested later in the year than most other crops. If the meats are to be extracted from the shells to bring a higher price, their removal may provide labor for persons not able physically to do more active types of work. With the machines developed for this purpose, it does not require great skill to do superior work.

More challenging than any of these possibilities in the field of nut culture are the problems calling for the development by crossing and selection of nuts of superior flavor, size, keeping qualities, and more resistant to severe weather and the attacks of fungi and insects. It may be distinctly worth while for all of us to know more about nuts than we probably now know.

The illustrations in this insert are by Elizabeth L. Burckmyer

THE STORY OF THE PINEAPPLE

By JOHN L. CARSON

Photographs courtesy Hawaiian Pineapple Company, Ltd.

Above is a newly-planted field of pineapple slips on the island of Lanai, Hawaiian Islands. The mulch paper strips give the fields their strange striped appearance. Below, a close-up of pineapple plants four months old. Note the mulch paper through holes in which the slips are planted. This paper keeps the soil warm and moist and prevents weed growth.

In 1882 Captain John Kidwell stopped going down to the sea in ships and settled in Hawaii near Honolulu. His hobby was growing and experimenting with plants, and he discovered flourishing nearby some wild pineapples. At that time the plant was known to tropical America as producing a small, woody fruit with an acid but pleasing flavor. It seemed to have little promise of becoming the table delicacy that it is today.

Captain Kidwell, however, felt confident that he could improve the size, texture and flavor of the fruit by careful cultivation. His first experiments did produce a larger pineapple, but its flavor and texture still left much to be desired. Then he recalled a pineapple he had seen in Central America, sent for one thousand slips and planted them. The red volcanic soil of the islands seemed to be just the tonic required. The immigrant plants prospered and developed large fruit of sweeter flavor and fine texture.

Enthusiastic about his fruit, Captain Kidwell opened a cannery on the Island of Oahu in 1892. However, he proved to be a better seaman and horticulturist than business man, and the venture had little success. Perhaps the world was not then ready for pineapples. In any event, the Captain soon sold his plantations and cannery and retired from business.

It was not until 1901 that the Hawaiian pineapple industry took a new spurt. A young Bostonian named James D. Dole was homesteading a 60-acre tract near Honolulu.

Here we see the gradual development of the pineapple. Above is the early and the advanced red cone stage. At the left the last flowers are blooming atop the pineapple. Below is a three-quarter matured fruit and a fully matured one. From planting of the slips to harvest time from eighteen to twenty-six months may have elapsed.

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He saw possibilities in this fruit and organized the Hawaiian Pineapple Co., Ltd. In the nearly forty years that have elapsed the pineapple has climbed to world fame. Today, between fifteen and twenty million cans of fruit or juice are shipped to all parts of the world, chiefly to the mainland of the United States. Some 25,000 acres on the islands of Oahu and Lanai are now under cultivation, and the latter island is owned entirely by the company. Here tractors yanked the cactuses from the soil and transformed from waste to fertility this 140-square-mile island. Highways and a complete city were built, and 15,000 acres of land were placed under cultivation.

Rich soil, temperate climate and tropical sunshine did their part in making the pineapple what it is today, and scientific methods of cultivation did the rest. When a field is cleared, sub-soilers and tractors

The island of Lanai was originally a waste of cactus, supporting a few half-starved cattle. Tractors went to work and transformed the island into a great pineapple farm, with 25,000 acres under cultivation. A complete city was built to care for the people employed by the industry on this island, which is devoted only to growing pineapples.

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put the soil in proper condition for planting. Strips of mulch paper, in rows three feet wide, are then laid on the freshly-plowed earth. This discourages weeds, keeps the soil friable, and conserves moisture and heat. As soon as the paper is down, holes are punched in double rows, and in each of these holes a slip is planted.

Pineapples are not grown from seed. Seeds, in fact, are rarely found and are used only for experiment. The

Harvest time has come. Picking is done by hand, the pineapples being gathered at the ends of rows where they are picked up by a traveling carrier that follows the pickers. Peak harvest months are June, July and August.

slip may be one of three kinds. One is called the "crown", and is taken from the top of the fruit. A second is called the "slip", and comes from the clusters that grow at the base of the fruit. The third is known as a "sucker", and it grows from the central stalk of the plant at the base of the leaves.

A few weeks after the slips have been planted they take root and send out new leaves. Between twelve and fifteen months after planting, a reddish, conical cluster of flower buds appears in the heart of the plant. This is similar to the pineapple fruit in appearance, but has tiny blue or violet flowers projecting from its sides. They start at the base. No more than four or five of these flowers appear at any one time, and they last only a few hours. It takes nearly a month for all of the flowers to open.

As the flowers wither and die, the flower head develops into a fruit. The crown grows larger, and in four to five months the mature pineapple is ready for picking. The mature plant now stands about waist high, a period ranging from eighteen to twenty-six months having elapsed between the planting of the first slip and the harvesting of the fruit. This mature plant is unique in that it produces only one fruit—known as the plant crop—at the time of the first picking.

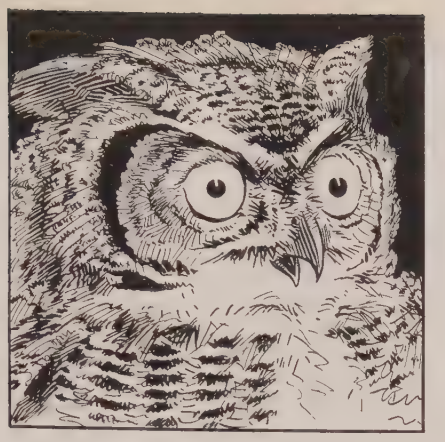
After this lone fruit is harvested from the plant crop, other shoots, called "suckers", develop. Field workers remove all but two of these, which are left to produce their own pineapples after another twelve months have passed. This fruit is known as the first ratoon, or second crop. Subsequently a second ratoon, or third crop, is produced in a similar manner. Usually this is the final crop that is harvested—in all five pineapples from one original slip. Then the land is plowed for rest and re-planting. There is not, however, any diminution in the quality of the fruit garnered from these second and third crops.

Pineapple picking continues throughout the year, although the heaviest harvest months are June, July and August. The fruit is picked when it is fully ripe, this being determined by sample tests of sugar content and flavor. Pickers harvest by hand, but a field fruit carrier follows them between the rows and does the carrying for them.

Preparing the pineapple for the market in sliced form, or as juice, is another interesting phase of this industry. However, it can not concern us here, and we will have to leave it to those fortunate enough to visit the Hawaiian Islands to accept the open invitation extended them to visit a pineapple cannery. Waste material is used to make bran for livestock feed, so the fruit does double duty.

When we consider what has been accomplished in the pineapple industry in creating a delicious and valuable item of diet from an originally unprepossessing wild plant, we see what man can do with one of Nature's gifts.

As We



See It

HAVE WE PROGRESSED? ★★

Every once in a while it is desirable to attempt an honest and sober estimate of how we are progressing in any given endeavor. We may well do this today in the field of wildlife conservation, taking as our text certain pertinent and pointed words originally published in 1922 in the *Izaak Walton League Monthly,* and republished in the November, 1939, issue of the League's magazine, *Outdoor America.*

These words come from the pens of two lovers of the outdoors—Emerson Hough and Zane Grey. In the first issue of the *Monthly*—in August, 1922—Mr. Hough contributed an editorial in which he posed the question: "Can any human agency work the miracle of giving the ages a part of the America that was ours?" He titled his editorial "Time to Call a Halt", and he deplored the sinful waste of America's resources and the taint of greed and commercialism that had been laid upon them. He expressed the hope that a miracle might stay the hand of destruction and turn the tide toward restoration. In the second issue of the *Monthly* the late Zane Grey contributed an editorial that all should read with care in attempting to estimate whether the nearly eighteen years that have elapsed have justified Emerson Hough's hope.

"The editorial Time to Call a Halt by Mr. Emerson Hough inspires me to add my appeal to his," wrote Zane Grey. "My ideal and motive are identical with his. Moreover my work has been wholly concerned with the beauty and wildness and Nature of America, all of which are vanishing.

"But I am more hopeless than Mr. Hough. I see only one possibility of preserving the game and fish, and something of the natural beauty of wild places, and the purity of inland waters. And here it is. If a million outdoor men who have sons will think of these sons, and band together to influence other men who have sons—then we may save something of America's outdoor joys for the boys.

"There is no other way. Commercialism has laid its sordid hand on the soul of our nation. Bolshevism is rampant, not only in labor circles, but in politics, in business, even in literature. If the real Americans do not rise in a body we are doomed.

"My appeal is not to save game and fish for sportsmen. I have forgotten the sportsmen. I do not care anything about saving game and fish for sportsmen. I want to save something of vanishing America. For its own sake! So that our children's children will know what a fish looks like, and will hear the sweet call of 'Bobwhite', and see all the living and nesting inhabitants of our beautiful land.

"We must stand powerfully and unalterably for the future sons of America. Otherwise we will fail of our opportunity.

"It is a serious thing for any writer to take up his pen against so-called sportsmen, and their peculiar ways of being happy. But it is necessary that this should be done. If honest and direct appeal fails to win thoughtless and ignorant hunters and fishermen to our cause then they must be scorned and flayed and ostracized until they are ashamed of their selfishness. No such appeal, however, can touch the heart of the hardened automobiling sportsmen, or the harpooning anglers, or the fakirs and wouldbes who want to see their pictures and names in newspapers and magazines.

"Naturalists and biologists and true lovers of Nature either despise or disapprove of sportsmen. There is justice in this. Something is wrong. Our heritage of outdoor pursuits is certainly a noble and splendid thing. Manly endeavor and toil and endurance make for the progress of the race. Nature abhors weaklings. And red-blooded pursuits operate against the appalling degeneracy of modern days. Nevertheless sportsmen, as a mass, are hypocrites, and are blind to the handwriting on the wall.

"My one hope for conservation of American forests and waters is to plant into every American father these queries. Do you want to preserve something of America for your son? Do you want him to inherit something of the love of outdoors that made our pioneers such great men? Do you want him to be manly, strong, truthful, and brave? Do you want him to be healthy? Do you want him, when he grows to manhood, to scorn his father and his nation for permitting the wanton destruction of our forests and the depletion of our waters?

"In this materialistic day it is almost impossible to get the ear of any man. With all men it is the selfish zest of the battle of life. But men do love their sons and, through them perhaps can be reached before it is too late. The mighty and unquenchable spirit of a million fathers could accomplish much."

Have we, then, progressed? Was Zane Grey's pessimism justified? Opinions will differ as to the answers to these questions. It is not our purpose here to discuss them at length, but we would like to mention certain items on the ledger of wildlife conservation progress. Some items are credits. Others are debits.

Perhaps the greatest positive accomplishment has been in public recognition of the importance of conservation. The word means more today to more people, although its definitions are many. Conservation is slowly finding its way into school programs, which is important. The rising generation needs to be prepared to improve on what has been done thus far. Public appreciation of the issue is being reflected in the work of the Federal Government in the wildlife field. The National Park Service policy of protection for all wildlife within the areas it administers has thus far been successfully defended. The United States Forest Service is slowly realizing that a wildlife program should be a part of the administration of the great areas under its control, although some of the older foresters still view it askance. Wildlife conservation forms an important branch of the Soil Conservation Service. Civilian Conservation Corps labor has been used on many wildlife projects. Some, such as poisoning campaigns, are of questionable value. Extension of the sanctuary system for migratory birds and other wildlife by the Biological Survey is definitely on the credit side, and constitutes a definite hope for the future of certain forms of wildlife, particularly migratory birds.

During the last few years there has grown up a body of wildlife technicians, men trained to study wildlife and its needs, and to practice what is known as game management. While this activity is almost entirely in the interests of production, control and increase of wildlife of sporting significance, it is a constructive endeavor compared with past practices. As an example, there has grown up a greater realization among intelligent sportsmen that campaigns against all hawks and owls are wrong and unjustified, but there is a long, long way to go still before the education of the rank and file will be adequate. Recognition of the fact that wilderness areas must be set aside now, if any of primitive America is to remain, has made progress. Such areas also provide wildlife reservoirs, but there is the constant threat of exploitation through ill-advised road building and other demands of selfish and short-sighted interests.

Complicating true progress, and thus on the debit side, is the increase in the number of hunters, and, consequently, a greater demand upon our resources of game birds and mammals. Seven and one-half million hunting licenses were sold in 1938. The number of duck hunters has doubled in a decade—a decade during which our migratory waterfowl reached their lowest ebb and are still in danger. The important revenues that these licenses represent, coupled with the income from the sale of the duck stamp and from the tax on arms and ammunition, which is diverted for wildlife conservation purposes, often operate against the best interests of wildlife. Closed seasons, shorter seasons, reduced bag limits and other restrictions would reduce these revenues, so such means of aiding wildlife restoration are avoided or postponed in the forlorn hope that present wildlife resources will stand the gaff.

A circumstance that militates against all efforts, however well-meant, to increase our wild species classed as game is that, with a few exceptions, all species are reduced in population. As they have decreased, substitutes, especially upland birds and mammals, have been placed in the ravaged covers, these derived either from foreign countries or by transplanting from other states not yet depleted. These efforts serve the purpose of continuing shooting from season to season. If such imported substitutes succeed, the problem is supposed to be solved. If they fail, the sportsmen are willing to try something else. In either case, our native species, from the standpoint of the naturalist and ecologist, has disappeared.

While there has been realization on the part of many intelligent leaders among sportsmen that they must stay their hands and help restore wildlife, they have problems within their own ranks. They face, on the one hand, the powerful influence of some wealthy men who can afford their own shooting grounds and want no restrictions, and, on the other hand, the ignorant and short-sighted sportsmen, many of them not reached by broad-minded and far-sighted leadership. To a large percentage of sportsmen's clubs conservation means crow shoots, hawk and owl extermination, and perhaps a little winter feeding of game birds. With such a viewpoint they are a liability and not an asset to wildlife conservation.

Predator control and poisoning campaigns continue at the behest of special interests and often are not based upon scientific proof of the need for control. Trapping continues to drain our fur resources and is generally as cruel in method as ever. Public sentiment is growing against inhumane traps, but this opinion has not been translated widely into regulations recognizing humanity. Stream pollution continues, with some progress in control in some sections, but with general improvement held up by the opposition of certain industries. These interests have constantly sought to defeat any measures that would force cleaning up the pollution situation. They have found refuge in support of legislation to investigate the question, despite the fact that a wealth of information is in hand upon which to predicate an effective control program. This is a vital subject, involving health, prosperity and recreation.

Thus one must regard wildlife conservation progress with mingled emotions. We have reason to be hopeful of the future, but no reason to be complacent. Some forms of wildlife have gone forever, others remain only as pitiful remnants. Wildlife restoration is going to be a hard uphill battle; victory will be endangered all along the front by selfishness, dishonesty, refusal to face the facts. The battle may yet be won, but only if we honestly weigh Zane Grey's words, which have as much potent meaning today as they did eighteen years ago. But it seems plain that the million fathers envisioned by him have not been able to overcome the efforts of the other millions who care neither for their own sons nor for others.

Conservation Comment

Further delay in the actual restoration of our migratory waterfowl will be the inevitable result of the lengthening of the season on ducks to sixty days in each of three zones. Shooting will begin in Alaska on September 1, and continue through the several zones until December 31, when the season closes in the southern zone. Shooting may start at sunrise and continue until four in the afternoon, instead of seven to four as was the case last year. The bag limit on most ducks is ten and the possession limit twenty, although the bag of canvasbacks, redheads, buffleheads and ruddy ducks is three in any one day. The bag limit on geese, reduced from five to four last year, has been further reduced to three in view of the precarious position of these birds. Shooting over baited waters and the use of live decoys are still prohibited.

In announcing this liberalization of the regulations, Harold L. Ickes, Secretary of the Interior, states that this is possible because of increases in numbers for five consecutive years. He asserts that—"Our policy is to keep the annual kill below the annual production until the carrying capacity of the winter feeding grounds has been reached." It is apparent that there have been increases—two is an increase over one—but our migratory waterfowl have not yet made a real comeback. At the Fifth North American Wildlife Conference in March of this year, Mr. Ickes said of these birds—"a shortage still exists that will continue until all of the areas on the continent suitable as habitats of waterfowl are carrying capacity populations." He asserted that relaxation of hunting restrictions cannot be made until this goal is reached. It has not been reached by the wildest stretch of the imagination.

Of course, we realize that this is a political year and that there are a million duck hunters, most of them of voting age.

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After declining rapidly in numbers over a period of years, the woodcock has belatedly become a subject of concern to game bird administrators. Studies have been inaugurated with considerable fanfare, and the alarm aroused is reflected in the 1940 migratory bird regulations, the season being cut from thirty to fifteen days. The daily bag limit of four remains. The need for this is credited to cold weather in the birds' wintering grounds in the South, although overshooting and illegal methods of capture have brought them to the present precarious state. Actually they should be given the protection of a closed season.

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During the fiscal year ending June 30, 1940, a total of 284,454 young men were accepted for enrollment in the Civilian Conservation Corps. The office of the Director of the CCC has compiled some interesting figures on the importance of this Corps, socially and economically, as well as from the conservation viewpoint. It was found that 95.66 per cent of the boys came from families needing some assistance. Slightly more than 45,000 enrollees had had no previous work experience. It was also found that 80.97 per cent of the boys had better than seventh grade education, while 397 had completed a college course.

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J. Paul Miller, biologist and conservation worker, has been appointed to the post of secretary of the American Wildlife Institute to fill the vacancy left by the resignation of C. M. Palmer, Jr., who resigned to devote his entire time to a large farm he has acquired in Delaware. Mr. Miller comes to the Institute from the Fish and Wildlife Service, where he has been in charge of research and program planning under the Pittman-Robertson Act.

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Wildlife in Maine is the title of a new leaflet by C. M. Aldous, leader of the Maine Cooperative Wildlife Research Unit, and A. D. Nutting, extension forestry specialist of the University of Maine. The leaflet presents concise data emphasizing the economic and recreational values of wildlife, exclusive of commercial fisheries. Copies are available from the Commission of Inland Fisheries and Game, Augusta, Maine.

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Indication of the economic importance of our National Forests may be obtained from the report of operations in the twenty-one forests in the Rocky Mountain region during the fiscal year ending June 30, 1940. Receipts collected totalled $697,730.90, of which $364,303.76 were from grazing fees and $283,073.02 from timber sales. Other revenues came from rental of lands for special uses, water power and occupancy trespass. During the same period 139,648,000 board feet of timber were harvested from these twenty-one forests. This was enough to build 10,000 frame houses, and the cutting furnished year-long employment for 2500 men and partial work for a thousand more.

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The title "National Wildlife Refuge" will now be applied to all but twelve of the 264 areas set aside for wildlife conservation purposes in the 13,635,000-acre system of refuges administered by the Fish and Wildlife Service of the United States Department of the Interior. Previously these areas have had various names, and it is felt that the new designation will do away with confusion and indicate which areas are federally owned and operated. Many states have similar state-administered areas. The twelve areas excepted have special purposes and their names are descriptive of these purposes, such as the National Bison Range and the Charles Sheldon Antelope Range.

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The Missouri Conservation Commission will soon be

carrying the message of conservation to the people of the state on the silver screen when the filming of a conservation motion picture is completed. A two-reeler, the motion picture will show what is being accomplished in wildlife restoration, and since Missourians proverbially have to be shown, this picture is designed to do it. Stacy Woodard, whose magic with the camera was hailed after the presentation of "The River", is doing the filming.

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Two field units of the Fish and Wildlife Service, one studying wildlife food habits and the other concerned with control of predators and rodents, have been consolidated into a new research laboratory at Denver, Colorado. Beside bringing about administrative economies, it is felt that this consolidation will result in a better coordination between research and control. Criticism of much of the predator control work of federal and state agencies has, in the past, arisen from the conviction that it was too often not justified by scientific fact. Such consolidations as this one would appear to be most advisable. The new unit will be under the direction of E. R. Kalmbach, a man of long and wide experience in wildlife research.

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State forest nurseries in Indiana are supporting a large stand of potential new forests following the planting of twenty-seven tons of tree seeds during the fall of 1939 and the spring of 1940. The Division of Forestry is placing special emphasis on the growing of trees that have marked value in furnishing food for birds and other forms of wildlife.

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People who know the outdoors and its wildlife have long realized that the beaver is one of our best conservationists. Nevertheless these animals have been trapped out of existence in many places by the demands of the fur trade. Perhaps, however, they will get a better break following the report of a cooperative study made on the Wasatch National Forest, Utah. A report from these studies shows that beavers, through their dams, regulated and maintained stream flow, reduced floods, prevented erosion and caught the silt carried by streams, thus preventing silt from entering reservoirs, lakes and lower valleys. In addition, the formation of ponds generally benefited other wildlife, including muskrats, minks, deer, ducks and upland game birds. There were few areas where beaver activities were not beneficial.

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Prizes totalling more than six hundred dollars were awarded in the 1940 humane trap contest sponsored annually by the American Humane Association. These awards went to inventors and trappers who devised the best traps to catch animals alive and unhurt; traps equipped with legholds instead of steel jaws; traps that catch animals and kill them immediately and humanely. A special prize was awarded for outstanding work by Frank D. Crippen of Glens Falls, New York, for improvements on previous traps, and state entries from Illinois, Massachusetts and Wisconsin were judged separately for special awards. W. E. Sanderson, wildlife director of the Association, declared that "years of research have brought us nearer our goal in enlightening the world concerning true conservation and the justice due our wildlife."

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American Wildlife for May-June, 1940, appeared with vastly improved typographical dress and more attractive format. It also marked its first appearance as the joint publication of the American Wildlife Institute and the National Wildlife Federation.

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The annual census of big game animals in National Forests revealed increases that in some instances have caused "wildlife slums", according to a report from the United States Forest Service. Instances of severe overcrowding, with resultant starvation on a number of ranges, were found, indicating that judiciously controlled hunting is necessary to improve the situation.

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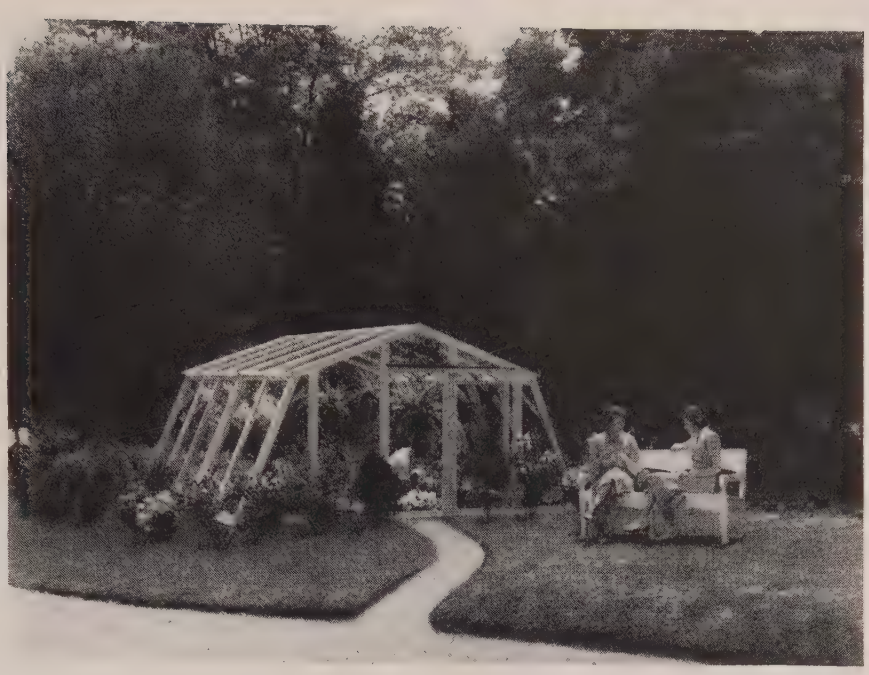
On Those Who Leave Crippled Deer

By FREDERIC F. VAN DE WATER

I KNOW it is not mere intuition that weights both my spirit and my stomach while the deer season endures, for I have sought through growing dusk to find and end a fawn whose forelegs had been bullet-shattered by some inferior to the suffering beast and I have heard Ray Pratt tell, in the dry voice beneath which our game warden hides pain, of the mercy killings he makes as the deer season's aftermath.

Perhaps my morality is lamentably warped, yet I hold that he who cripples and leaves to exquisitely slow death a live thing has wrought unenviable iniquity. I know that each hunting season does more incalculable harm to man than to the defenceless thing he slaughters.

My own generally not too stalwart belief in an incandescent and sulphurous hell is fortified each deer season. Lacking it, how can lovers of justice and mercy hope for the requital of those who annually cripple beautiful, terrifically vital beings and leave them light-heartedly to protracted torture?—In "November" in *The Circling Year,* published by The John Day Company, New York.



THE LITTLE GREENHOUSE BECAME A FIXTURE IN THE GARDEN SCENE

When it was first set up it was planned to "set-it-by" after the seedlings had grown enough to be transplanted to the garden. It proved, however, such an addition to the grounds that it was not taken down. An automatic heating arrangement was made so that the modest little greenhouse produced flowers the year around and in wide variety. In the photograph we see the setting in the fall after the house had been set up in the spring, as shown in the picture below

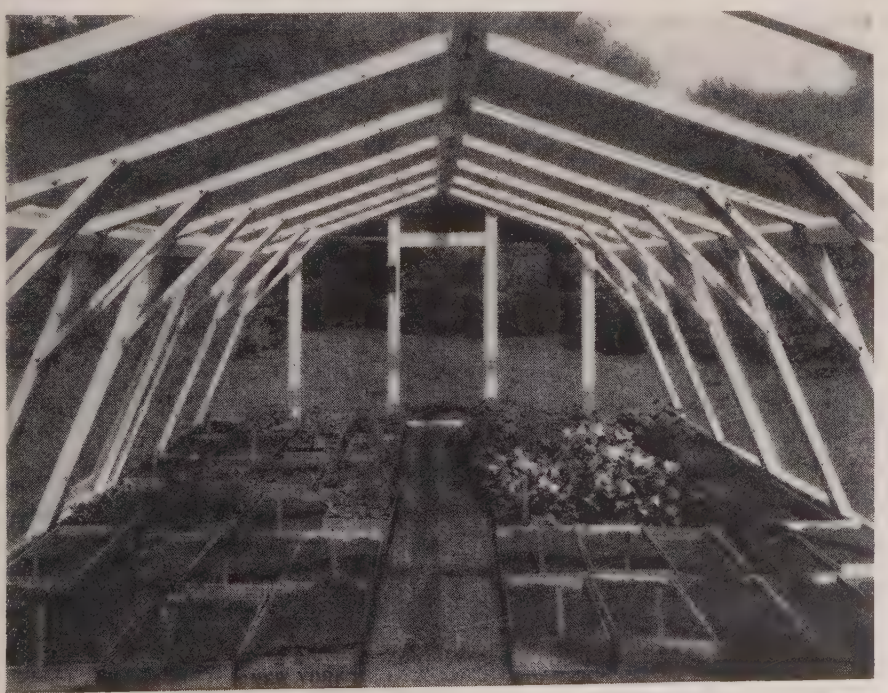
An English Garden Secret

By L. W. C. TUTHILL

IT WAS a Sunday in June, three years ago in days of peace, when we were motoring down from Edinburgh to London. For several days friends, with that untiring British energy born of love of flowers and the outdoors, had been taking me to see endless gardens. Most of these were of the formal sort, which seem to have a tendency to make my back ache. The impersonal, especially in gardens, bores me, and somehow I can not help resenting the manicuring and permanent-waving of Nature.

Even after the passage of years I still quail at the memory of the utter disgust I prompted in my English friends when I failed to enthuse about the painfully carpet-patterned garden at Windsor Castle. Another day I did achieve some redemption when I rose enthusiastically to the beauties of the lacy-flowered ceiling in the Edward Chapel at Westminster Abbey. My explanation that I liked set floriation when used as symbols, but resented attempts to make living flower into static marble, was at least partially understood.

But to return to our trip from Edinburgh. It was leisurely, and every now and then we would get glimpses, over hedges, of modest and unmolded gardens. They were delightful, and the item that particularly impressed me was the greenhouse that seemed so indispensable. Almost every garden had one, tucked away in some corner, or at the garden edge. They were not large ones. In fact they were definitely "junior" greenhouses; neat, snug and within the reach of the average pocketbook.



Having some years before indulged myself in one of those truly American luxuries, alluringly named "Glass Garden", these little British affairs aroused my curiosity. One looked decidedly strange at first, with its slanting sides and glass extending to within a foot of the ground. There was no regular foundation, and I was informed that "they set on the ground of themselves." This greenhouse was ingeniously held together with hooks and a few bolts so that when the plants had

gotten a good start in their glass nursery it could easily be taken down and "set-by", the space it occupied being added to the garden.

England has, of course, climatic conditions that favor the finest garden results. But the rather general use of these greenhouses undoubtedly adds to garden success. In fact, the British gardener usually scorns planting seeds in the open. They are given their start inside and under glass, and are put outdoors when they have attained a size and virility that allows them literally to jump into quick, strong growth.

If I brought no other impression or memory back from England, I at least returned with enough enthusiasm about these little greenhouses to make a pest of myself. I specially pestered a friend who heads a concern that builds greenhouses—the big variety. The burden of my song was that if he had any sense he would design and build a greenhouse that was modest in size and cost; one, for example, that a man with the urge and one hundred and fifty dollars could buy.

ASSEMBLING THE GREENHOUSE
The sectional construction, with the glass sliding into weather-tight slots, makes the installation of the house a simple matter

Two years passed and it seemed as though I had sung loudly but without result. Then, one day, I dropped in at the factory and found them erecting a greenhouse that was the exact counterpart of the one in England. Yes, they assured me, it was just the same, for they had secured the rights to manufacture this glass flower nursery—named Orlyt—and had it all figured out to sell them in ten sizes, at prices ranging from $89 to $379. And so it turned out I was a better singer than I thought.

As soon as one of my gardener friends heard about the greenhouse he dashed off and bought one. It was thirteen feet wide and ten feet long. With all materials it cost him $149, and it gave me an opportunity to help him set it up. We did it in a long day and had a lot of fun. The sides and framework were easily hooked and bolted together. There was no puttying to do with the glass. Each pane, twenty-eight inches wide, slipped into weather-tight slots. Presto, and there was the greenhouse!

My friend planned to use it to start flower and vegetable plants and then to "set-it-by" after the English fashion. His wife, however, changed that by making her plans to bring in her garden favorites in the fall. He found the idea contagious and has never taken the house down. Instead, he had benches made, one of them specially to grow plants the hydroponic way—no soil, just water with periodic doses of nutrient salts.

Of course, the problem of heating arose, once a year-around program was adopted. The house heating system was too far away to be tapped. While still pondering this question he received a circular from the greenhouse people describing a little, thermostatically-controlled, automatic oil heater. My friend describes this as "an answer to the maiden's prayer." It truly was efficient.

What do they grow, you ask? Great guns, what don't they grow! I'm forever being dragged into that blooming house—and blooming is the correct word—to see some new horticultural triumph. But it seems to me that even more important than what they grow is the growth in themselves. They have found added joy of living from this greenhouse. It has quieted nerves, rounded off edges, created for them a mutual hobby, given them an understanding born of association with their flower friends. I, too, know what benefits can come from such an activity, having learned much from a dozen years of intimate association with my own glass garden.

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Now I Know

By RUTH L. CARD

Now I know what a fairy's foot would feel like,
If one of the Little Folk, adventuring,
Should glide up a moonbeam, rest upon my finger,
Weary, perhaps, of dancing in a ring.

Now I know what a fairy's wings would sound like—
Their quick, soft flutter and their tiny beat—
If one of the Little Folk, suddenly startled,
Should pass very near me in a swift retreat.

Now I know what a fairy's eyes would look like,
If one of the Little Folk should stray from the band—
For with a flutter and a quick, bright glance at me,
A chickadee has lighted on my hand.

NE MUSHROOM IS NOTED FOR ITS BLEEDING HABIT

FUNGUS FOLKS

That have personalities and habits that make study of them fascinating

By ELLSWORTH JAEGER

ANOTHER HAS A TASTE FOR INSECTS ON ITS MENU

THE AUTUMN woodland seems a painted fairyland in its costume of scarlet, gold, tan and brown. And when we wander along its many trails, we know it ıust be enchanted, for everywhere we find those boon ɔmpanions of the "wee folk", the mushrooms and toad-ools. Although fairies, pixies, gnomes, leprechauns and ıe rest appear in no census tabulations, the mushrooms ıd toadstools do. They are living things, tabulated by the ycologists. As living plants, however, they are more mys-rious than the figmentary wee folk themselves.

Mushrooms are no strangers. We eat them with steak, soup, on toast and in other ways. Yet they do not seem this earth, but rather like change-ngs left upon the world's doorstep the pixies. It is when we visit m in their home meadow or oodland, that we really find how merous and mystifying is this ngus family. There we may see em as magic stars, elfin cups, fairy ncil rings. We may see one blush, d another holding lanterns glow-g with ghostly light.

The autumn dark holds many sur-ises, but none so startling, per-ps, as the unearthly illumination the "jack-o'-lantern" mushroom, *itocybe illudens.* At night its soft ɔw brings to mind pictures of elfin revelries, for surely ne but the sprites could use light such as this. By day is mushroom is bright yellow, as we find it in clumps on the stumps of old chestnuts, oaks and other de-duous trees. Night transforms it into a ghost lantern. ıe freshness of the fungus determines its brilliance, an d specimen giving off little or no light. So strong does glow that at times it will affect photographic films. The k-o'-lantern mushroom is not edible; an investigation ɔws that it contains some of the poisons found in the adly species, *Amanita muscaria.* So enjoy its light, but touch it not if you wish to retain the bloom of health.

JACK-O'-LANTERN MUSHROOM GLOWS FOR ELFIN REVELS

Can you imagine a mushroom blushing? In the fall you may find one that will actually turn a rosy hue if you touch it. It may be that it blushes at the misdeeds of its villainous relatives, the poisonous amanitas. As poisoners, this family outdoes the Borgias, and, although the blushing mushroom, *Amanita rubescens,* itself is free from any murder taint, it is best to shun it because of its family's reputation. Yellowish-white in color, it will change to a pink tone when handled, although some specimens have been found that refuse to blush. At times it tries to conceal its family connections by changing its shape, and it is not uncommon to see a much deformed specimen. In most cases, however, it has an identifying ruff at the upper part of the stem, and also the cup of this dangerous family at the base. Since there is no known antidote for amanita poison, both the innocent and the guilty should be passed by lest the renegade be mistaken for the blameless species. Well might this fungus blush at the crimes of its relatives.

Where the soil is sandy, you may sometimes find rough star-shaped growths of dirty grayish-brown, which look as though Nature had been playing with a pair of scissors. It is only during the wet weather, however, that you find these star formations. When the days are dry, the star-like segments are closed and form a cup shape, which surrounds the round, fruiting body. This is the "barometer earth-star", a fungus whose actions are like those of a barometer, its star-like rays opening only when moisture is heavy in the air.

When it is time to release the spores, a small hole opens at the top of the mushroom. Through this the spores leave home, often floating for miles on a convenient breeze. Later they develop into other star-like fungus formations

THE BLUSHING MUSHROOM TAKES ON A ROSY HUE WHEN IT IS HANDLED

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THE EARTH STARS ARE THE BAROMETERS OF THE OUTDOORS IF YOU WILL WATCH

to the delight and mystification of the woodland wanderer.

Fall is fungus time, the season to see these companions of the elves. Sometimes you may come upon little black goblets, an inch or two in height. To the observer, they seem to be the remains of some gnomish drinking party held in the dark hours and hidden from mortal eyes. These cups suggest black magic and evil spells. Their serrated rims look as if witches' teeth had bitten into the cups, so bitter, perhaps, the brew. In spite of its goblin-like appearance, the black goblet is a common member of the fungus tribe. In it is no poisonous witches' brew, only magic spores —the promise of more black goblets of the future. It grows upon the decaying limbs of trees.

Then there are the bleeding fungi. These fragile folk can often be found on old stumps or decayed wood. They seem to be a sociable lot, for they are often crowded together like revelers on a night club dance floor. In fact, they cling so closely together that they look as though they needed the combined support of the fungus brotherhood to face the outside world. In spite of their sociability, however, they are "thin skinned" and sensitive. They bruise easily and when roughly handled their pink flesh turns blood red. Their caps in early life are cone-shaped, but as they grow older the style of their headgear changes to a bell-shaped form. The caps are not large, ranging from a half-inch to an inch in diameter. In color they may be whitish, flesh-colored, or even a dull red, the coloring being stronger toward the outer margins of the caps. One of the surest identifications is the fact that, if injured or cut, a blood red juice exudes from the stem, as with the bloodroot.

Frequently, during a damp autumn, you may discover, on the decayed trunks of pine and hemlock, a fungus growth that is so shining that it will immediately attract your attention. It looks for all the world as though the brownie folk had just put their finishing touches upon it from their varnish and lacquer pots. This fungus is known as the "lacquered ganoderma", and is an irregular kidney shape. It is easily seen, since it is a shining red that changes to a chestnut brown as it grows older. The brilliant, varnished crust covers only the upper surface and the irregular stem. The surface is uneven and wrinkled with coarse grooves. The fungus as a whole is corky in texture and remarkably light in weight. The flesh is woody and light in color. Getting a firm grip in the bark or decayed wood, it stands upright, a living advertisement of Nature's outdoor lacquer and varnish.

There is a common fungus that is often seen on our lawns, and resembles a shaggy Easter egg, standing on end. As it matures, however, it seems to rot upon its stem, dissolving into a black liquid. This is no putrefaction, however, and the black liquid may be used for ink. In fact, it would serve admirably for writing important docu-

THE DANGEROUS FELLOWS ARE FLY AMANITA AND THE DESTROYING ANGEL

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RED SQUIRRELS LIKE TO EAT MUSHROOMS AND HAVE UNIQUE STORAGE PLACES

ments, since it would be almost impossible for forgers to imitate, especially if the spores of other mushrooms were added, since the microscope would then reveal any forgery. The liquid makes indelible ink, and, if gum arabic and essence of cloves are added, takes on sticking qualities, as well as a pleasant odor.

The ink mushrooms, *Coprinus,* are fast-growing, and are often found in closely-packed groups. Like many of the mushrooms, they are able to exert great pressure, and some have been known to break up thick, newly-made concrete sidewalks. Only fresh specimens should be eaten, and they should be cooked as quickly as possible, otherwise they soon will turn into the unpleasant black ink.

THE BLACK GOBLET LOOKS AS THOUGH IT HAD HELD A WITCH BREW

Fungi are famed in song and story as the stage properties of the elves, but none are more closely associated with the "little people" than the so-called "fairy ring mushroom". It is rather startling to see a number of mushrooms growing in a circle, as though placed there by other than Nature's hands. They look, indeed, like magic circles where the fairies dance. But the only magic really connected with this creation is the magic of Nature herself. The beginning of the fairy ring may have been a single mushroom that dropped its spores around its base. The following season a small ring of them grew and dropped their spores. In this way the circle grew larger each year. Some fairy rings are believed to be 600 years old. Old timers say that the magic ring always marks a spot where lightning struck—just another myth added to the fairy mushroom's long list.

It is certainly not unusual for insects to feed upon the fungus folk, but it is news when a mushroom dines upon an insect. However, if you have sharp eyes you may discover such a meal. The fungus that has acquired this strange appetite has an orange cone about three-quarters of an inch high, mounted on a crooked stem. Its roots have penetrated an insect chrysalis, absorbing the inmate, which was perhaps almost ready to emerge.

A relative of this strange growth is often found in the Far East. There it has taken a fancy to a certain caterpillar and can be found attached to its victim's head. Feeding until it has nothing but the empty shell of the caterpillar, it then takes root in the earth to continue its development. The dried fungus, with the caterpillar attached, can be purchased in the drug shops of China, where it is used as medicine. Just how effective it is as such is open to considerable conjecture. The Chinese are ingenious.

When a fungus is ripe smoke-like dust may be seen to come from it. This is its seed, or spores, which are microscopic in size. These seed bodies are so small that they easily float in the lightest air currents and thus are carried vast distances. Many of us have squeezed a puff ball to make it puff its "smoke", but few realize that in this smoke billions of seed spores were set free. It is difficult to talk in numbers, when speaking of mushroom spores, for a squeezed puff ball may release more than seven trillion spores. In spite of the great numbers of spores, however, only a few ever have a chance of maturing. The spores develop into the mushroom plant, or "mycelium", as it is called. These are fine threads, often white in color, commonly found under decaying leaves and bark. From these the fruiting parts grow.

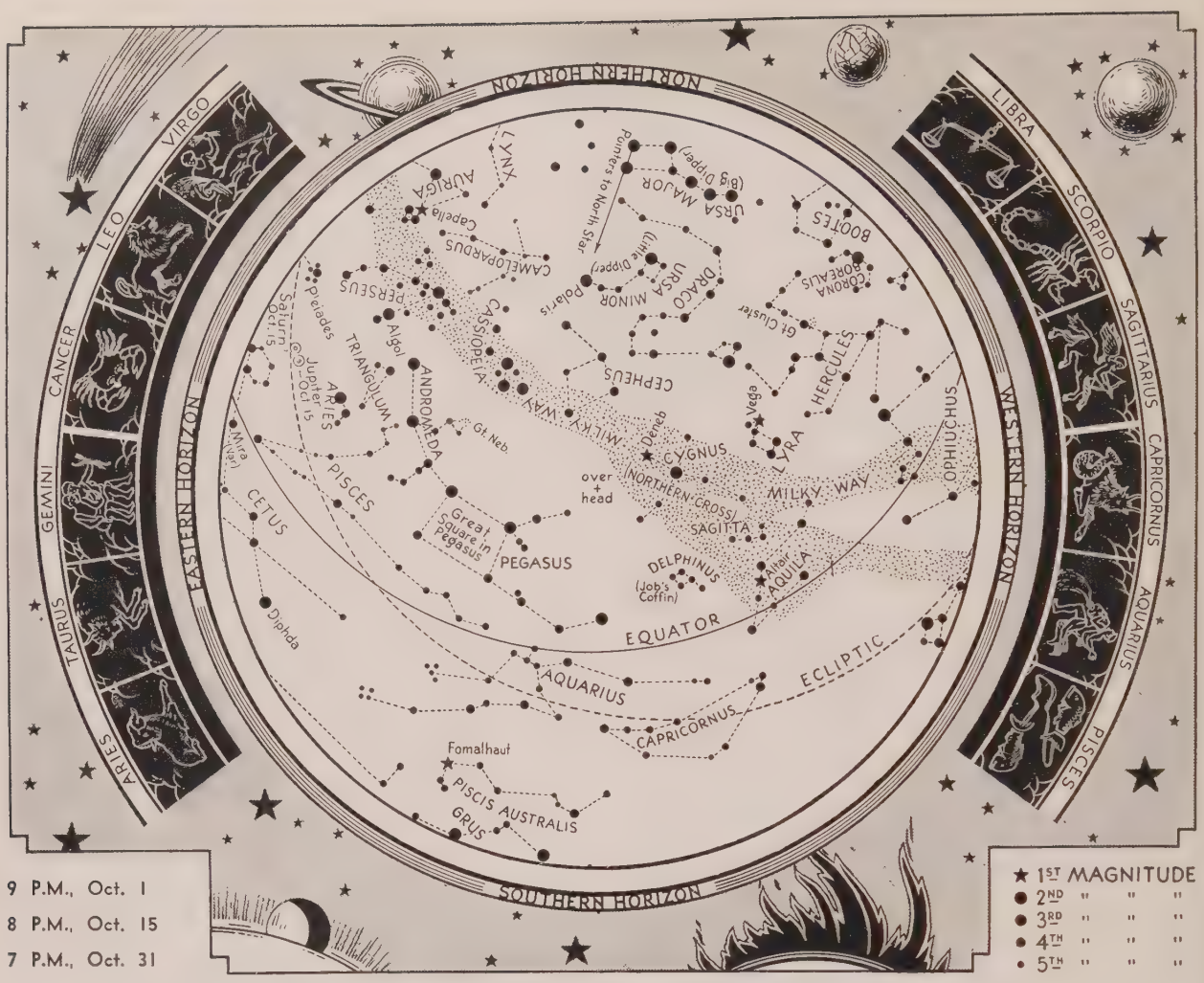
In open grassy spots you may sometimes find "lawn umbrellas" of the elves. Although they do not have the bright hues of the real article, they can easily be seen because of their unusual height. Some of these fungus parasols have been known to be eight inches across the top, and twenty or more inches in height, thus providing ample shade for any elfin garden party. Like the ginger cookie house of our fairy tales, this parasol not only provides shelter, but delicious food as well. It is a favorite among mushroom epicures. Some mushroom eaters say that it tastes best when broiled over coals of a camp fire and basted with butter.

Each year reports appear of deaths due to poisonous "toadstools". Two of the worst fungus criminals are the "fly amanita", *Amanita muscaria,* and the "destroying angel", *Amanita phalloides.* The fly amanita ranges in color from a deep orange to yellow. The surface of the cap is covered with scales. This and its ruff-like collar on the stem and a cup, or bulb-like volva, help to identify it.

The destroying angel is probably the deadliest of all vegetation. Its poison is subtle and is rarely felt until it is too late for treatment. In color it varies from glossy white, yellowish, dull green to olive-green and greenish-brown. Like the fly amanita, it also has a death cup and ruff collar when mature. The white form resembles somewhat the common field mushroom, but the edible one has pink or purple gills, while the "destroyer's" gills are white. Even to touch these poisoners is dangerous.

Man is not alone in his taste for the palate-tickling mushrooms. The red squirrel, too, is noted for his fungus appetite. He not only feeds upon them, but he dries and stores them for other days. At times he may be seen laboring with some huge mushroom, dragging it to a safe hiding place. A red squirrel may have a number of fungus pantries, such as hollow trees and birds' nests, and at times his fungus hoard may be stored in old tin cans, but the most common places are the forked branches of trees. Here the twigs seem to bear strange fruit. On close examination the "fruit" turns out to be shriveled and dried mushrooms.

So here are a few brief introductions to some of the fungus folks with the outstanding personalities. Good guides to these fungi are available, and you will find your wanderings afield much more interesting if you will learn which is safe and edible and which is not.



To use this map hold it before you in a vertical position and turn it until the direction of the compass that you wish to face is at the bottom. Then below the center of the map, which is the point overhead, will be seen the constellations visible in that part of the heavens. It will not be necessary to turn the map if the direction faced is south.

SKY NEWS FOR OCTOBER

By ISABEL M. LEWIS

In an astronomical way October will be an eventful month. On the first day of October there will be a fine total eclipse of the sun of long duration, visible under exceptionally favorable conditions in Brazil and South Africa. Even though many who had planned to travel to one or the other of these countries for the eclipse have had to give up their plans because of world conditions, there will still be a number of eclipse expeditions within the path of totality.

Partial phases of this eclipse will be visible over all of South America, except the extreme southern part, most of Central America, the West Indies and Florida, southern Africa, and Madagascar. In Florida only a very small partial eclipse will be visible at sunrise.

The narrow belt within which the total eclipse will occur is more than five thousand miles long and averages about 130 miles in width. It starts from the coast of Colombia on the Pacific, with Tumaco on its southern limit. There the sun rises eclipsed. The path is then across Colombia, southern Venezuela and Brazil to Pernambuco; hence across the south Atlantic, where the eclipse occurs at midday, to an arid region in South Africa, 300 miles north of Capetown. Here in the High Veldt and the Great Karroo the eclipse takes place in the afternoon. East London, on the east coast, lies within the path of totality, which passes eastward into the Indian Ocean and leaves the earth at sunset several hundred miles southeast of Madagascar.

It is remarkable that the path of total eclipse, both in Brazil and South Africa, passes over regions that are excessively dry and subject to periodic droughts. Most expeditions are expected to locate on the Brazilian plateau near Campina Grande, or Quixeramobim, two or three hundred miles west of Pernambuco, or in South Africa near Calvinia, or Queenstown.

Observers near the central line of total eclipse in Brazil will be favored with nearly five minutes of totality and a sun high in the morning sky; those in South Africa will

have about one minute less of total eclipse in the late afternoon. On the whole those who expect to observe the eclipse in South America should find conditions more favorable than those who will set up their equipment in South Africa.

The solar corona, the most spectacular feature of a total eclipse of the sun, is now a subject of study in this country, even without an eclipse. The highest observatory in the world is now located on Fremont Pass, near Climax, Colorado, at an elevation of 11,318 feet. It was established by the Harvard College Observatory on the property of the Climax Molybdenum Company for the purpose chiefly of making direct and continuous observations of the solar corona. This will be done by means of the coronagraph, which has been constructed at the Harvard College Observatory in the past three years and modelled after the original coronagraph invented by the French astronomer, Dr. Bernard Lyot of the Meudon Observatory of Paris. Dr. Donald H. Menzel who was the head of the Harvard Observatory Eclipse Expedition to Ak-Bulak, U.S.S.R., in 1936, will be in charge of the new station in Colorado. Dr. Lyot originally used for his observations at a station in the Pyrenees a type of telescope in which a dark disk concealed the bright solar image and created an artificial solar eclipse. As the solar corona is only about half as bright as the full moon, it is concealed by the scattering of sunlight near the sun by the atmosphere of the earth. This produces a brightness about 6000 times that of the brightest parts of the corona. If the earth were not surrounded by an atmosphere the corona would always be visible from our planet, just as it is from the moon.

To observe the corona without an eclipse one must find a way of reducing this luminous haze that surrounds the sun at all times and masks the faintly luminous corona. Not only has this problem been attacked and partially solved by the invention of the coronagraph, but very promising results also have been obtained with a coronaviser developed in the Bell Telephone Company Laboratories by A. M. Skellett, and based on the technique of television. The separation of the corona from the glare of light around the sun that conceals it is accomplished by means of electrical filters. Here again use is made of a masking disk, as in the original coronagraph by Dr. Lyot. A small mirror in front of this disk reflects into a suntrap much of the sunlight that enters the telescope. The reproduction of the image of the corona, after the glare of sunlight has been greatly reduced, is accomplished by electrical means. Although much progress has been made already in the direction of observing the solar corona without an eclipse by means of the coronagraph and coronaviser, the moon still supplies the best dark disk for masking the light of the sun scattered by the earth's atmosphere. All the intricate details of the inner corona, and the long streamers of the outer corona, may be recorded during the few moments of a total solar eclipse with an accuracy and completeness that would be impossible to attain at any other time.

The second of three conjunctions of the planets Jupiter and Saturn within six months will take place on October 11. The first of these occurred on August 15, and the last of the three will take place on February 20, 1941. This triple conjunction of these two giant planets, the largest in the solar system, is one of the rarest of celestial phenomena. It is known to have occurred in the years 6-7 B. C., preceding the birth of Christ probably by about two years. The next occurrence of the phenomenon was in 1682-83, and at what date in the future it will happen again we cannot say, but it may be many centuries. A single conjunction of the two planets occurs every nineteen and a fraction years.

The usual motion of a planet in its orbit around the sun is from west to east. This is called direct motion. On the far side of its orbit from the earth it moves from west to east against the background of the stars; but there will be two times in each revolution, one when east and the other when west of the sun, at which it will be moving either directly toward or directly away from the earth. It is then said to be stationary in its orbit.

Saturn was stationary in its orbit on August 27, and Jupiter on September 4. If the planet has been moving from west to east—i.e. with direct motion—before reaching this point it reverses its motion, or retrogrades, as it is called, afterwards, and vice versa. The exterior planets, such as Jupiter and Saturn, so called because their orbits lie outside that of the earth, retrograde within a few months of the dates of their opposition with the sun. During this period the earth, moving in the same direction that they are but more rapidly, passes them, and the effect of their falling behind the earth is that they appear to move in the opposite direction, or retrograde.

Both Jupiter and Saturn are retrograding this month, and will continue to do so for the remainder of the year. Jupiter will again reach a stationary point the last day of the year, after which its motion will once more be west to east among the stars, or direct. The second of the triple conjunctions, the one on October 11, occurs while both planets are retrograding. The first, on August 15, occurred when the two planets were in direct motion. A requirement of a triple conjunction is that the planets shall be close together over a long period, as they have been this year, and that this period shall include their dates of opposition. They will occur early in November within seventeen hours of each other. The two planets are now in fine position for observation, as they are visible during the greater part of the night. Jupiter will be scarcely more than a degree distant from Saturn and to the north of it throughout the month.

Venus is still a magnificent object in the morning sky. Mars also is visible before sunrise, rising about an hour and a half before the sun. Mercury will be at greatest eastern elongation October 20, but will be poorly placed for observation, setting within about three-quarters of an hour of the sun.

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THE SCHOOL PAGE ★★★

EDITED BY DR. E. LAURENCE PALMER

Professor of Rural Education, Cornell University, and Director of Nature Education, The American Nature Association

Nuts in School and Out

A fond father once complained to me that his first grade child was taught to sing, "Here we go gathering nuts in May". He said that the schools should not teach that one gathered nuts in May when anyone knew that nuts were crops harvested in the fall. I was able to enlighten him by pointing out that the child must have failed to learn her lesson well, since the phrase is not "nuts in May" but "nuts and may". The "may" refers to the fruits of the may tree, or hawthorn, which were gathered for decoration. "The palm and may make cheery houses gay" is an old saying.

But nutting time is always one of celebration, one that used to be enjoyed by many more youngsters than is now the case. Formerly we built many school Nature experiences about the prickles in chestnut burs. We used to teach about the blacksmith who stood under the spreading chestnut tree. But now the blacksmith and his tree are little more than picturesque history to the average school child. The automobile wiped out one, and the blight ruined the other. What do we have left?

As suggested in the educational insert in this issue of NATURE MAGAZINE nuts offer us new opportunities for study. To the city child, they are something that comes from the nut store or the delicatessen. To the rural child, they are much less important than they were in the days of abundant beechnuts, hazel nuts and chestnuts.

If we wish to study the geography of the mixed nuts of the grocery store, we will find interesting regional limitations of the different species. This includes the tropics and the cooler northern States. The insert omits, for the most part, the still cooler Canada, but it, and the accompanying references, provide rich suggestions for further exploration. If one wished to consider the nuts of the Southern Hemisphere, he might even point out a justification for gathering "nuts in May".

Nuts offer considerable opportunity to point out vocational opportunities to children. Even such relatively slow-growing species as the black walnuts may be planted by persons in the thirties or forties with some assurance that they will live to get some financial return for their investment. But there is a big field for nut growing with the shorter-lived species, which bring a quicker return worth investigating. Much of the cut-over territory of our great Northwest is proving ideal for raising filberts, and one of our candidates for the Vice-Presidency this fall has a special interest in their culture.

Much land unsuitable for raising standard crops may prove highly valuable for raising nuts. And young people in such organizations as the 4H Clubs might well develop an interest in nuts for the use of this land. Then, too, nuts figure prominently as food for certain forms of wildlife. Because of this, an understanding of the requirements of a nut tree or shrub is necessary for good wildlife management. Much of the earlier practices in forestry in this country made our wooded lands into biological deserts so far as wildlife is concerned. Now we are recommending the planting of nut trees in the gullies and along the borders, where they may serve as wildlife lunch counters and as anchors for the soil. A local survey of the abundance of nut-producing plants, to learn if the region is producing a fair amount of rich food in this way, should not be an impossible school venture.

If one must be conventional in school, and avoid doing something as unusual as that suggested above, there should be still plenty to do with nuts. They may be drawn. Charts showing their distribution and their products may be made for exhibits. Their meats may be rubbed on paper to produce an oily translucence to show one of the simplest tests for oil. Their nutritive value may be considered in planning a balanced diet, whether for a hike, for service in the army or for ordinary human existence. The use of nut shells and husks in producing charcoal used in some types of gas masks may be interesting. Literature is full of references to nuts, and many sayings refer to them in one way or another. A listing of these sayings might not be a bad English project. It might include references to certain things being "hard nuts to crack", or to activities in which we "get down to the kernel" of the matter.

If we must build our school activities around difficult mental gymnastics and clear thinking, nuts will give us something really to think about. The name "nut" is applied to so many different plant parts that the common name is botanically almost meaningless. Its use is hopelessly confused in many popular science books for schools, notably in one of the most recently published elementary series, which emphasizes the word science but not the spirit of science. It is difficult to understand why so much emphasis should be placed on plant morphology in the very lowest grades as seems to be increasingly popular. It is more difficult to understand why, where this emphasis is given, the authors of this new series should recommend the study of "other seeds" with nuts, when nuts are technically fruits and not seeds.

Even with all the emphasis that has been given to the study of bean seeds and corn fruits, this recent series, written by persons in responsible positions, fails to recognize the most fundamental differences.

If one wishes to develop clear thinking and believes in any sort of mental discipline, we can recommend highly that one visit a nut store, buy a sample of everything offered, get a copy of Gray's *Lessons*, and find out what is what in the realm of nuts. We do not recommend this as an elementary school activity. We hesitate to recommend it for all high school students. We know from experience that it is too much for some college students, and it obviously is too involved for some textbook writers. It should lead to clear thinking, however, and in this day and age, when European nations topple and when we are called upon to decide the relative merits of important political issues, clear thinking is needed.

We do not pretend that there is necessarily a relationship that guarantees that the most able plant morphologist will also be the most dependable political economist. Neither can able educators, necessarily, be able plant morphologists. We know too many people with proved ability in their fields to feel confident that superiority in one field guarantees superiority in all fields. There is not the slightest reason, however, why superiority in one should limit ability in another if both call for clear logical thinking such as is required to trace the morphology of a handful of "mixed nuts".

"When is a 'nut' a nut?" might make a good subject for debate in a science club meeting. The answer could almost invariably be found in one of the better dictionaries, or in a botany manual, but ordinarily one may question what is found on this subject in many books used at the pre-college levels. "What shall we believe and what shall we question?" is always important, whether we deal with science, with education, politics, astrology, religion or ethics.

We have too much sloppy thinking and sloppy reasoning in too many fields these days not to show some concern for the future. A Ph.D. member of a university faculty, writing of her experiences as a survivor in the sinking of the Athenia, said that she knew a submarine went under her life boat because of the variation in pressure felt on the boat as the submarine passed under it. She admitted that she did not see the boat, hear the boat or smell the boat—just felt it by the pressure on a life boat. The lady, who I happen to know personally, undoubtedly is a splendid teacher of physical education but I doubt her right to claim that she knew a submarine went under her boat by the evidence she offered. Some clear thinking is needed by all of us in these times, and possibly the study of the morphology of nuts may provide valuable training.

David Starr Jordan once wrote on "The Value of Nature Study" along these general lines. He said: "When a child is at home, the sun rises in the East, the air is clear when the sun shines, and within his limited range of knowledge, cause and effect stand clearly related. This relation to the world we call orientation, in its original meaning knowing which way is East.

"One primary value of Nature study is that it carries this orientation on through the affairs of life. The child, in the complex relations of society and of public affairs, is led still to know which way is East, what are the real relations of cause and effect, what is truth and how it differs from mere opinion or sentiment.

"For the study of Nature gives a certainty as to certain facts which no waves of sentiment can change; it leads to a sure knowledge of some things which no weight of authority on the other side could possibly shake. 'This is the value,' Agassiz once said, 'of the study of Nature herself. She leads us back to absolute truth, wherever we may wander.' "

Bound volumes of Nature Magazine, each carefully indexed, make one of the best Nature study texts anywhere available. The Association has a limited supply of most volumes in stock.

CAMERA TRAILS

(Continued from page 435)

ine is simply removed and put back the ther side up. The camera operates at 16, 4, 32 and 64 frames per second, and has a iew finder built in the top of the camera nat contains adapters for any of the several nterchangeable lenses that are available. It s priced at $97.50 with a 13 mm. f/1.9 ens. Your dealer has it. The other, the 'ilmo Auto Master by Bell and Howell, is 16 mm. camera that combines the con-enience of magazine loading with the tur-et head that holds three lenses and auto-natically brings into place the proper view nder for the lens in use. It has the same lm speeds as the Eastman 90.

Eastman, Bell and Howell, and Craig have rought out new editing viewers that make he task of selecting the film you want to eep permanently not only easier than it sed to be but really pleasant. I recently used he Bell and Howell Filmotion viewer to look t the movies rather than go to the trouble f setting up the screen and the projector. 'our dealer has all three of these.

The Revere Camera Company of 326 East 1st Street, Chicago, Illinois, has brought out wo cameras in the double 8 line. The first, Model 88, which has been mentioned here efore, uses the double 8 film, has five shut-r speeds and a convenient view finder, it priced at $39.50 with an f/2.5 lens. Its ompanion camera, Model 99, uses the same lm and has a turret that holds three lenses ith one lens. It is priced at $65.00. When riting for information, please do not for-et to mention this department.

Your negatives will dry more quickly and ith less danger of water spots if you soak m for a few minutes in the new solution led Foto-Foam produced by the Whole-le Photographic Supply Company, 133 East th Street, New York City. If your dealer sn't Foto-Foam write to them for informa-on and mention this department.

Another liquid you should have is Vokar atch Patch made by the Vokar Corpora-on, 208 West Washington Street, Ann rbor, Michigan. Smeared on a negative it minates scratches, or at least reduces them a point that has enabled me to make rfect ten-diameter enlargements from nega-es that were formerly useless.

Camera Trails is granted space for the nefit of Nature readers who are interested photography. It is the desire of its con-ctor to make it as valuable as possible, d this can only be accomplished with your sistance in the form of criticisms and sug-stions. Furthermore, Camera Trails main-ns a service to help you in the solution your photographic problems. Address your mmunications to Norris W. Harkness, ture Magazine, 1214 Sixteenth Street, W., Washington, D. C.

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NATURE IN PRINT

As a convenience to readers the books reviewed in the pages of Nature Magazine may be ordered through the book department of the American Nature Association, 1214 16th St., Washington, D. C.

(Continued from page 439)

stream ran through a forest in which lived a one-time college professor, his queer brother, and his beautiful, mysteriously gifted daughter, Elaine, whose "hair was a golden mist, and her face in the darkness was soft as the petals of a rhododendron blossom." Of such characters are stories made, and this one is made well.

Those who wish may fashion an allegory about Elaine, no less delightfully than they could about the maiden Rima in W. H. Hudson's *Green Mansions,* and like Mr. Peterson anticipate her arrival in some seventh spring. "The laurels," he is sure, "will smell sweeter and the creek will be more musical. There will be singing in the treetops, and the sky will press more closely against the hills. . . . We shall know that there is, in truth, no life so happy."

Those who are forced to live in the cities, week in and week end, of course need no persuasion of the happiness of vacations, but it seems to me that there can never be too much emphasis placed on the ease with which even city dwellers can enjoy the relaxation and renewal of spirits that come with participation in the world of wild things, seeing, if they will, even more of the ways of wild creatures than one could heedlessly see in the country merely by noting what happens to turn up. These possibilities are so apparent in Alvin M. Peterson's recently published *Wild Bird Neighbors* that I regret his omission of an introduction which might have described the experiences he had in gathering the information for his thirty-three interesting and instructive chapters on common species of birds. In the chapters on crows and hawks and on the green heron it is apparent, however, that his observations were made in the vicinity of Milwaukee, and his valuable book is thus another testimony to outdoor opportunities near at hand.

"Several Boy Scouts and I," he says, "spent many glorious days during the spring a few years ago along the freight branch of a railroad. We called the place we liked best the 'Boxcars'. This was a marshy spot one-half mile long that bordered the railway on either side and was located about four miles west of the city limits."

Even within our city limits, in our own yards, there is an engrossing order of life, undomesticated, little disturbed by man, yet far from uncivilized. Julie Closson Kenly gathers many of the strange and mystifying discoveries regarding this world of insects and spiders into her most recent volume, called *Voices from the Grass.* Her publishers report that this work was named an "Honor Book" for older children in the *New York Herald Tribune's* Children's Spring Book Festival, yet I must confess that until I had reached page 205 I had not surmised that I was reading a book intended for those whose age I more distinctly envy than remember. There is no reason to doubt the appeal of *Voices from the Grass* to younger readers, but it is also nicely weighted with psychological and philosophical considerations that give it significance for others, and no one is too old to read facts for the first time.

The insects have faced the same primary necessities of life that human beings face. In their way of living there seems to be much that we can learn, and the social insects have perhaps pointed out for us the ultimate results of highly civilized, socialized living. If we understand their societies well we may be able to direct our own social life more intelligently. Perhaps we would try even harder to escape from the city. The insect mind *seems* to be entirely different from ours, however, and we should like to think of ourselves as free from the hazards that their civilizing has brought after many more ages than we have yet lived. "The real enigma presented to us by the insects is, then," as Mrs. Kenly says, "how deep do our human roots penetrate into this thing we call 'Nature'? Are all forms of life integrated on some hidden plane to which some, more than others, have access?"

There are, of course, many things about our own subconscious minds that we do not understand and we may have more in common with the insects than we know. Mrs. Kenly cites as an example an incident recorded in Frederic W. H. Myers's *Human Personality and Its Survival of Bodily Death.* "When Benjamin Hall Blyth was a little fellow only six years old," she writes, "one day he asked his father to tell him the hour he was born; and on learning it was four o'clock in the morning, the child again asked his father to look at his watch and tell him what time it was then. After a moment's thought this amazing child, a mere baby, announced the number of seconds that had elapsed since his birth! On reaching home his father did some calculating on paper, and discovered that the child's answer was wrong according to his own mathematics. He told his son this, and the boy—probably looking up from blocks or Mother Goose—asked, 'Did you remember the two leap-years?' Upon recalculating, it was found that the original sum the boy had stated was correct." Certainly our wonder at the mind of young Master Ben Blyth is little different from our wonder at the mind of insects.

The Ancients had a way, as we know, of explaining their wonder about various creatures in terms of their own human experience, the myth of Arachne having in fact given us the scientific name for the order Arachnida. Elaine V. Emans retells this myth in the opening pages of her book *About Spiders,* yet it was not her poetic interest in mythology that led her into spider study, for she dedicates her volume to Dr. Karl A. Stiles of Coe College in Iowa, "whose fifteen-minute radio talk on spiders one December afternoon opened to me a new world." There is something intriguing in the thought of one of the most advanced instruments of our civilization bringing to a young lady the inspiration to study the ancient order of Arachnida.

Fascinated by spiders, Miss Emans was surprised to find it estimated that "there are probably not thirty men in the whole United States who study spiders even casually," and in an informal, light-hearted, but informative way she has written a book that should arouse the interest of others. She describes the structure and life history of spiders in general, writes in more detail about several different species, discusses "The Economic Side", and brings the enemies of spiders to reckoning. How successful Professor Stiles was in converting a listener into a spider fan is apparent in Miss Emans's conclusion to her discussion of the enemies of this most skillful predator. "The writing of this chapter," she confesses, "has played upon my sympathies for Arachne and her kind. Confronted with such various and cruel natural enemies, surely she is in need of the friendship and kindness of man." Anyone who reads *About Spiders* will be both entertained and instructed and may even come to share Miss Emans's zeal.

"In conclusion," she writes, "I have this one request to make of the large aggregation of persons afflicted with Miss Muffetitis: Will you not give the spiders who sit down beside you a fair chance? They are really grand little folk, and the lady spiders, in particular, it seems to me, merit a tipping of hats."

Anyone who does respond to Miss Emans's exhortations will find *The Spider Book* to be an invaluable help. For a quarter of a century this comprehensive work by John Henry Comstock has served the needs of both beginners and mature students. Out of print for some years, it has recently been revised by W. J. Gertsch, of the American Museum of Natural History. Dr. Gertsch has not altered the general aspect of the volume, with which many are already familiar, and has not changed the chapters that deal with morphology and life habits. He has, however, brought the material in the book relating to the classification of the various forms of spiders more nearly up to date, and most important of all has made it possible again to obtain the book without canvassing the second-hand stores. The work devotes ninety-two pages to a systematic description of the forms of life other than spiders in the order Arachnida, and then in the next hundred and twenty-three pages describes the external anatomy, internal anatomy, and the life of spiders. During a recent illness, I read these first two hundred and some pages with a great deal of interest, finding many parts of them surprisingly easy reading for such a scientific work and a reference volume. The remainder of the book is devoted to a systematic description of the various forms of spiders and will be indispensable to those who will wish to identify their own specimens.

Whether we live in the country or in the city, we shall have opportunities for studying the Arachnids, and I should recommend *The Spider Book* for the shelves of a week-end home, too. I presume it will make little difference to any one where he is if he is in the midst of the fascinating study of spiders, and perhaps this may be an answer to some of us in our wondering about country homes, week-end homes, and long vacations. Miss Emans's converted Little Miss Muffet would not long sit pining for transportation after a spider had sat down beside her, nor would she be frightened away.

Brief Review

HARDY FERNS AND THEIR CULTURE, edited by Carol H. Woodward; 40

es; 29 illustrations; published by the
v York Botanical Garden, Bronx Park,
v York; 25 cents.
Collaboration of nine fern specialists who
e valuable advice to the fern enthusiast.
BASKET PIONEERING, by Osma Pal-
Couch; 164 pages; 64 illustrations;
sed edition; published by Orange Judd
blishing Company; $1.75.
A popular handbook containing concise
etry directions with clear, simple diagrams
gned for the beginnner as well as the
e experienced basket weaver.
FLORAL MORPHOLOGY, by E. R.
nders; 132 pages; published by the Chem-
Publishing Company, 148 Lafayette
et, New York City; $1.50.
An exposition of the general principles that
regarded as underlying floral arrange-
t.
BACKWOODSMEN, by George Clinton
hur; 100 pages; published by the Christo-
r Publishing House, Boston, Mass.; $1.50.
A true history of backwoodsmen of the
rks, including the life of Nathanial
ders.
PROF AND EASY, by Hobart Ryland;
pages; published by the Christopher
blishing House, Boston, Mass.; $1.25.
Entertainingly written story of two dogs,
f being a Chesapeake Bay retriever.
THE GARDEN CLINIC, by Laurence
ir; 146 pages; illustrations by the author;
blished by Macmillan; $2.00.
Advice on the care and cultivation of gar-
favorites.
TROUT FISHING IN NEW ZEALAND
WARTIME, by F. W. Pickard; 180
es; 40 illustrations; published by G. P.
nam's Sons, New York; $2.00.
The title is descriptive. Fishermen will en-
it.
NATURE HANDBOOK FOR SPORTS-
EN AND CONSERVATIONISTS, by
ace L. Poole; 56 pages; published by the
or, 1954 Ellis St., Dubuque, Iowa; 30
s.
ocket-sized handbook with simple identi-
ion keys to common trees, rocks,
rals, fish, etc.

Mrs. Benchley's Story

far as we know Belle J. Benchley is the
woman director of a zoo. She presides
the Zoological Gardens of San Diego,
re she is housekeeper, chief dietitian, con-
ng physician and homemaker for a large
varied family. Her understanding and
and night enthusiasm for her charges are
cted in a fascinating book based upon
oo experiences and entitled *My Life in a
-Made Jungle.* It is an informally-told
that makes grand reading. Illustrations
any of Mrs. Benchley's zoo friends are
oduced in this book, which is published
ittle, Brown and Company at three dol-

Civic Annual

; always, the *American Planning and
Annual* is a valuable source of informa-
on the progress of civic planning and on
ational parks. Between its covers reports
tivities in this field are brought together
preserved. Published by the American
ning and Civic Association, Union Trust
ding, Washington, D. C., copies are
able at three dollars each.

Into New Guinea

Off the northern coast of Australia lies a large island known as New Guinea. Much of its area is unknown to the white man, is inhabited by head-hunters and tribes still practising cannibalism, and is rich in exotic flora and fauna. To collect specimens and to observe the natural life of this area, Richard Archbold and A. L. Rand penetrated 600 miles into this region, and the story of their experiences and discoveries is told within the covers of the book entitled *New Guinea Expedition.* The authors have not indulged in any melodramatic picture of their exploits, and have told a straightforward story that is all the more thrilling, valuable and interesting. Published by Robert M. McBride and Company, the book sells for $3.50.

Bacteriological Text

It is the conviction of D. B. Swingle of Montana State College that "bacteriology must be regarded as a science in itself, with orderly arrangement, principles, and applications comparable to those found in other sciences." It is in this conviction that Dr. Swingle has organized the text of his book, *General Bacteriology,* a textbook designed to cover a year's work in this field. The text assumes that the student using it will be doing so against a background of courses in general chemistry—with probably some organic chemistry—and in fundamental biology. Published by D. Van Nostrand Company, this volume sells for three dollars.

Natural History Index

A total of 3365 books and periodicals in the natural history field are indexed in *Natural History Index-Guide,* which is a notable contribution by Brent Altsheler. This volume is a revised and much enlarged second edition of an earlier guide brought out in 1936. In all there are 54,063 references to indexed publications, and these are entered under 9477 subject headings. Consistent with accessibility, the best information obtainable is referred to for descriptions of the most interesting common things found in the forests, fields, waters, in the earth, in the skies, in the air, and in human life, as offered in the library records of natural history. The book is published by the H. W. Wilson Company.

Noah's Ark—Modern Style

The New Noah's Ark is an appropriate and descriptive title for the book by Andre Demaison, translated from the original French by Eric Sutton. Its author had from early youth an active interest in animals and had dreamed of roaming about collecting rare animals alive. His dream came true and formed the basis of a charmingly written and exciting story of adventure. Published by Macmillan, it sells for $2.50.

Snake Key

Number 16 in the series of bulletins issued by the Zoological Society of San Diego, California, is entitled *A Key to the Snakes of the United States.* Prepared by C. B. Perkins, who is in charge of reptiles for the Society, this 64-page bulletin is a compilation of interest and value to the serious student of reptiles. The price is 85 cents.

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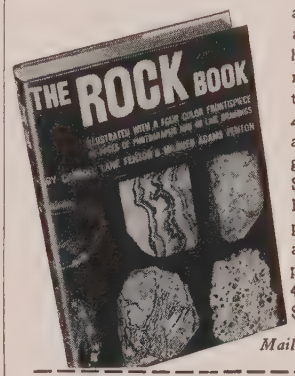

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Shenandoah Handbook

A second and revised edition of *Beautiful Shenandoah,* a handbook for visitors to Shenandoah National Park, has been issued. It contains maps of the Skyline Drive and the park trails; descriptive data and lists of the trees, shrubs, wildflowers, birds and mammals; summary of park regulations; lists of accommodations, and pictures of the area. Prepared by Darwin Lambert, this 78-page booklet is available from the Lambert Company, Luray, Virginia, at thirty-five cents.

Flower Family Album

A unique approach, physically and textually, to the flowers has been devised by Helen Field Fischer in *The Flower Family Album.* A radio garden consultant, the author has drawn upon her experiences with what the public wants to know, and has worked out a clever identification text without going too deeply into the botanical details. The text is supplemented by excellent descriptive illustrations by Gretchen Harsbarger. The book is published jointly by author and illustrator and is available at $2.50 from Helen Field Fischer, Box 5, Shenandoah, Iowa.

Friendly Trees

In a little book, to which he gives the title *Tree Neighbors,* Russell Doubleday writes informally, entertainingly and informatively about what he calls "companionable trees". He leaves the giant trees to the foresters and devotes himself to trees that can be grown around our homes to shade our houses and give sanctuary to bird friends. Thirty-two trees found east of the Mississippi and north of Charleston, South Carolina, are described and pictured. An attractive and handy little book, it is published by Doubleday, Doran and Company and sells for $1.75.

Biological Adventuring

There is much inspiration and suggestion to be found in *Adventures in Biology,* just published by the New York Association of Biology Teachers. It is a collaboration of experienced teachers in this field and is designed to encourage pupil experimentation. The Association may well be proud of this publication, which should be available in every classroom where biology is studied. There are illustrations and indices, a good bibliography and a special project section written by students. This book is brought out as a contribution to progress in this study and without profit to anyone. Copies are available at fifty cents, and a twenty per cent discount is allowed for orders of ten or more copies. Orders should be sent to Mrs. Estella R. Steiner, Grover Cleveland High School, 2127 Himrod Street, Ridgewood, Queens, New York, remittances being made out to the New York Association of Biology Teachers.

About Vitamin E

It is quite a task keeping up with vitamins these days and the Chemical Publishing Company of New York is doing its part by bringing out a little book entitled *Vitamin E.* It is a symposium of information gathered by workers with vitamins and is designed for one who knows what this sort of study is all about. The price is two dollars.

Bear Mountain Birds

A check list of the birds of Bear Mountain Park has been compiled by William H. Carr, Park Naturalist, and issued by the Bear Mountain Trailside Museums. The mimeographed booklet lists 206 different kinds of birds. Both the wood duck and the pileated woodpecker are found to be making a come-back thanks to the protection afforded wildlife in this area. One of the unusual finds for this area listed is the American Magpie.

Physical Sciences

"The progress made in the field of science in the last quarter of a century has had a pronounced effect upon our modern life. It has influenced our existence at every turn. The individual branches of science are no longer academic entities, each cloistered in its own ivory tower; they are changing, growing fields that touch each other at a multitude of points. Their study becomes fruitful only when they are considered together so that all the interrelationships are apparent."

From this paragraph in the preface to *The Physical Sciences* we may gather the manner in which E. J. Cable, R. W. Getchell and W. H. Kadesch, co-authors, have approached their subject in this book. The result is an up-to-date, well-rounded and valuable textbook directed mainly to high school and elementary college science. It would be equally valuable to one wishing to have a science reference book on one's home book shelves. Published by Prentice-Hall, this volume retails for five dollars, with special school prices.

Excellent Bibliography

Compiled by Eva L. Gordon of Cornell University and reprinted from the twenty-fourth edition of Anna Botsford Comstock's *Handbook of Nature Study,* an excellent pamphlet entitled *A Bibliography of Nature Study* is now available for twenty-five cents from the Comstock Publishing Company, 124 Roberts Place, Ithaca, New York. This is a valuable reprint.

American Education Week

"Education for the Common Defense" is the general theme for the twentieth annual observance of American Education Week, November 10 to 16. No theme could be more timely, and each day is dedicated to some phase of this issue, which affects all Americans. Thursday, November 14, is set aside for the subject, "Safeguarding Natural Resources." The National Education Association has prepared a 32-page handbook to aid in the proper observance of this week.

Philippine Quail

Recently the zoo at Hershey, Pennsylvania, was thrown into something of an uproar by the successful hatching of a tiny Philippine quail, which emerges from the shell a tiny mite one-half inch long. The egg was kept in an incubator for twenty-one days. The little dark cousin of our bob-white grows to about half the latter's size, but has a joyous whistle closely like that of our own bird.

Garden Photograph Contest

Last year the Pittsburgh Garden Center made a pioneer effort to sponsor a nation-wide garden photography contest. It met with such enthusiastic response that the contest will be repeated this year. Entries must be filed by October 31, 1940, and the photographic exhibition will be held from November 8 to 30. Full details with respect to the contest may be obtained by writing to the Pittsburgh Garden Center, Schenley Park, Pittsburgh, Pennsylvania.

Animals in Action

This is the title that Gayle Pickwell gives to his latest book in the group that has included three earlier titles—*Birds, Deserts* and *Weather.* These books are large in size—about nine by twelve—and beautifully illustrated with large pictures. Dr. Pickwell's text is clear and popular but packed with information. The sixty-eight plates in this volume are from some of his finest photographs. The author deals with animals in their daily lives; their relationships; animals as parents; manner of getting food. The text covers a wide field and should be an inspiration for further exploration by the reader. In this group of books Gayle Pickwell, who is Professor of Zoology at San Jose State College in California, has made a notable contribution to Nature literature. *Animals in Action* is published by Whittlesey House, McGraw-Hill Book Company, at four dollars.

Technical Dictionary

A most handy volume in this scientific age is *Chamber's Technical Dictionary,* which has been compiled under the editorship of C. F. Tweney and L. E. C. Hughes. It covers terms used in pure and applied science, medicine, the chief manufacturing industries, engineering, construction and the mechanic trades. A staff of thirty experts and specialists collaborated in the compilation. This is a new, authoritative and valuable reference work. It is published by Macmillan at five dollars.

Film Strips

Announcement of the award of the contract for production of the Department of Agriculture film strips calls attention again to the availability of this service so valuable to extension workers, teachers and others. The small costs involved have resulted in wide distribution. A price list of available film strips and instructions for purchasing may be obtained by writing to the Extension Service, United States Department of Agriculture, Washington, D. C.

Two Flying Squirrels

Flippy and Skippy were two flying squirrels and together they give their names to an attractive little book for the youngsters by Donn Crane. It is attractively illustrated by the author. Flying squirrels often have made interesting pets, and the two personable actors in this story are no exception. Published by the John C. Winston Company, this little book sells for $1.50.

THE LIZARD'S TAIL

by David Damon

If you have caught, or have tried to catch, any of the various species of long-tailed lizards, you were probably impressed by the sacrifice the reptile makes in parting with his tail in order that his life may be spared. Protective coloration, speed, and the long, fragile tail are Nature's contributions to these cold-blooded creatures that enable them to escape many enemies. A pursuing animal that grabs the tail of its would-be prey may be satisfied with only the tail, but the lizard probably gets much more satisfaction out of escaping with his life.

The long tail has another use, as I discovered one warm September afternoon in 1938 while making some wildlife observations in an oak-hickory woods in central Missouri. As I was watching some small birds I heard intermittent rustlings of the dried leaves on the ground about twenty feet to my left. Cautiously I picked my way towards the scene of activity so as not to disturb the animal—whatever it was. Maneuvering to a point where I could get a good view of the activities, I squatted at the base of a tree and focused my binoculars on what proved to be a miniature battle-field. I now had a ringside seat.

Here was a young five-lined skink, *Eumeces quinquelineatus*, about six inches long (half of which was tail), attacking a common species of brown spider. The spider's body was about one-third inch long and its legs had a spread of about one inch. The front legs were held up in a fighting position. Time after time the little blue-tailed lizard, as he is popularly called, charged at the spider with lightning movements, but each time the spider managed to avoid the small, vicious jaws. Between charges the movements of each creature were very slow and deliberate. Like an aggressive boxer watching for an opening, the skink moved constantly around his opponent, while the latter, slowly pivoting, always faced the skink with upraised fore legs. After what seemed like many minutes of this alternate charging and sneaking by the lizard and successful defense by the spider, I was of the opinion that endurance would decide the winner.

Then I realized that the skink was changing his tactics. Instead of exposing himself as much as he did at first, he seemed to make no effort to remain under cover of the leaves while slowly sneaking around for a flank, or rear attack. Of course, his long tail remained exposed after the rest of his body was hidden, and on one occasion this was the undoing of the spider. Instead of making its escape as it might have easily done, the spider was intently watching the moving tail, probably thinking it was the dangerous end of the skink, when the latter suddenly made a flank attack and grabbed the spider. Instantly the lizard began to shake the spider so rapidly that a buzzing noise was produced in the dry leaves. The spider's body flew into the air, and dropped a few inches away and lay motionless while the victor swallowed a leg that had been severed from the body.

After "buzzing" the other seven legs from the arachnid's body and devouring them, the skink next attacked the body. Apparently it proved to be too large and hard to swallow because it was finally discarded. Failing to find more food at that time, the skink climbed to the sunny side of a tree to rest and to settle his dinner. Thus it may be that the long tail of a lizard may serve to get him food as well as to prevent him from being food for another animal.

THE WILD FLOWER HAUNTS

by James H. Hocking

Many of the wild flowers are lovelier than any of the cultivated sort, and they have the added charm of being away from the ordinary haunts of people.

All over the country, lovers of the wild things are trying to organize effective measures against the spoliation of the wild flower. Much of the destruction is due to sheer ignorance, a feeling that because the flowers are "wild" they are common property, to be picked and almost as soon thrown aside to wither and die.

Every true lover of the wild flowers might become a voluntary deputy guardian and say the kind but often effective word when he sees the thoughtless denuding the land of our precious heritage. Down in the swamp the brown cattails launch their downy covering, and the white snow heads and blue pickerelweed may be nestling down in the mud at their feet. The pink and white turtlehead can be found in their company, and a little later the flaming red cardinal-flower lights up a dark place along the brook.

Joe Pyeweed, which gets its name from the legend of an old Indian who made a medicine for chills and fever out of its leaves, is in bloom, its purple tips often in company with the ironweed of a darker brown color and with a taller stalk. The leaves of these are a rich, luscious green.

All about are the yellow and gold flowers of the toad-flax, "butter and egg"; "bouncing bet" has possession of miles of barren sand along the railroad tracks. The leaves of this flower, often called soapwort, make a good lather when wet and rubbed on the hands. The milkweed is catching insects, unwittingly entangling its friends; and the beautiful butterfly weed, also a milkweed, with its rich orange heads, is a shining mark among the tall growth of the wayside and meadows. *Don't pick it.* The delicate lily-of-the-valley flowers of the spreading dogbane, with their olive green leaves, are marching on their conquering way, contending with the goldenrod for a place in the world of weeds. The bee balm, or Oswego tea, a deep red and odd-shaped flower, is sure to attract notice, and the wild bergamot's lavender will add its note of color to the purple of the beautiful asters. How lovely, soft green are the tall stalks of the mullein, with their spikes of yellow flowers.

Ox-eye daisies and the millions of white ones that take toll of the farm land will be brought home by wandering tourists, to cheer dreary tenements. The blue and white fruit of the dogwoods, and the blue berries of the lovely Virginia creeper, whose leaves turn into varied colors, will fill the observing eye and make one pause to think of the wonderful and varied pictures that Nature is laying at our feet. The tawny day lilies have been profuse and gorgeous during the past month, and here and there the peer of all of the wild lilies, the red wood-lily, has held its upstanding pedals to the sun, and we can say a silent prayer for their preservation and pass on.

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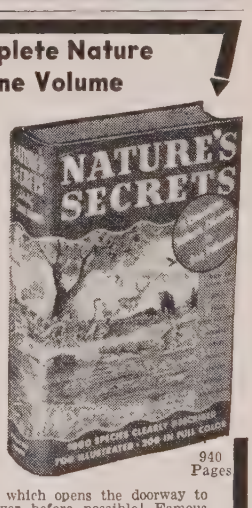

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FOR THE WINGS OF A BIRD

(Continued from page 444)

pipers flying at 10,000 to 12,000 feet. Wetmore gives yellowlegs and black-bellied plover at 10,000 to 12,000 feet, and cranes, pelicans, ducks and geese at 3000 to 8000 feet, flying between feeding grounds. However, one must remember that there is no difference between war and peace for the game birds in this civilized world! Humboldt, at a point in the Andes 12,958 feet above sea level, reports a condor flying 6876 feet above him. That makes a total of 18,834 feet above sea level for that condor. A. F. R. Wollaston reports that he saw lammergeiers at 24,000 to 25,000 feet, and godwits and curlews at 20,000 feet. However, the prize goes to some geese at a height of 29,000 feet. They were recorded while some pictures were being taken of the sun and they appeared to the developer. What a surprise! This estimate of 29,000 feet places them about five and one-half miles high—high enough for anyone!

In considering migrations many interesting problems come up. First of all is the question: "How do the birds eat on these immense journeys?" That question can be answered in several ways. Some birds eat on the wing as they fly, and they probably have the nicest trips. Others, however, must stop and forage at intervals along the way. There are usually miles of ocean that must be crossed without stopping for anything. So most birds that are going to migrate fatten up before, and then live on that fat. This is much like hibernation in animals. The fat stored up by the bird for several weeks before leaving is used to supply energy on the way, and the bird has regained its youthful figure by the time it has reached its journey's end. Another interesting thing we have probably all noticed is that some birds always form a definite order for their long flights. They take a wedgeshaped formation and fly in serried rank. The classic examples, of course, are the geese and ducks.

As you have all heard at some time or other, birds do travel great distances. For instance, a wandering albatross that was banded five hundred miles from New Zealand on December 12, 1847, was recaptured on December 20, 1847, off the coast of Chili. The ruby-throated hummingbird, no larger than your little finger, makes a six-hundred-mile non-stop flight to Yucatan across the Gulf of Mexico, and does it twice a year. Three noddy terns and two sooty terns were once captured and shipped eight hundred and fifty miles and released. They returned in five days. The blackpoll warbler also makes its journey twice a year. Some of them go some seven thousand miles.

Probably the two extremes of migration are shown by the Arctic tern and the long-tailed chickadee. The former has been known to nest within four hundred and fifty miles of the North Pole and flies very near to the South Pole. Such a bird makes more than eleven thousand miles each way, not counting extra mileage for foraging. That is around the world every year. Contrast this to the chickadee who merely makes a latitudinal migration down to the foothills some eight thousand feet down and a few miles away from his mountain home. A young Arctic tern that was banded on the coast of Labrador on July 22, 1927, was found dead near La Rochelle, France, on Oct. 1, 1927. Another was banded on July 13, 1913, in Maine. It was found dead in August, 1917, in South Nigeria, Africa. Still another, a nestling, was banded on July 23, 1928, in Turnevik Bay, Labrador, and was found near Port Shepstone, Natal, Africa, on November 14, the same year. The shortest possible distance he could have gone was more than eight thousand miles. His probable route would take him many hundred miles farther.

While speaking of latitudinal migrations I find an interesting report of a loon that was banded at Manitoulin Island, Ontario, Sept. 7, 1935, and was shot in Manitoba on June 19, 1937. One yellowlegs was banded at Cape Cod, Massachusetts, August 28, 1935, and was killed at Lamentin, Martinique, French West Indies. This is some 1900 miles and its time would have made it travel more than three hundred miles a day. A dowitcher was banded in Massachusetts in August, 1935, and killed in the Canal Zone nearly 2300 miles away. This bird must have flown at least twenty-five miles a day.

One could go on indefinitely giving examples of the immense distances covered by birds in their ordered or erratic flights. There are also innumerable cases of birds returning or remaining year after year in the same yard of the same town, nesting and rearing young in the same nest on the same site. However, the main thing that all these examples illustrate is that although we watch, wonder, experiment and surmise; although we try to imitate and understand, we still know very little of this great secret of Nature—THE FLIGHT OF BIRDS.

A FLICKER BUILDS A NEST

by Pauline H. Sutherland

One morning in spring, leaving for my office shortly before nine o'clock, I looked around to see if there was anything unusual in the world of Nature. The road I always followed had a park on one side, overlooking the river, and on the other side were houses, set back from the street, and having many large trees in front. Naturally these trees harbored many birds and, when walking along, one would often see a chickadee flitting from branch to branch, or a little black and white creeper, too busily engaged pecking the insects off a large white birch or an elm trunk to notice a mere human. Or one would catch bits of song from somewhere in the bursting leaves of the treetops.

On this particular morning, I noticed nothing unusual and went on to the day's work. But, returning home to lunch, I noticed a pair of yellow-shafted flickers flying back and forth from a tree, in front of one of the houses, to the park opposite. Coming closer I saw, to my amazement, that the entire lawn surrounding the tree was covered with fresh chips of wood. In the tree, on the side facing the pavement, was a large hole about ten feet from the ground. The spade work was done, and now the birds were busy making their quarters quite to their liking.

With what industry had those long beaks chiselled their way through the tough bark in those few short hours. One could only wonder once more at the cleverness of Nature and feel disappointment at having missed the process of nest-building. And wonder, further, why, as flickers usually favor the big trees in woody places, this pair chose a tree so close to a much frequented road.

SHELLED ARISTOCRATS

(Continued from page 456)

300 have been developed by one man alone, Dr. George Washington Carver, a 76-year-old Negro scientist, regarded as one of the greatest agricultural chemists of his time. Years ago he turned down a $100,000-a-year job as research worker in Thomas A. Edison's laboratories. Dr. Carver likes to paint flowers, applying clay pigments to paper produced from peanut shells. During the course of his scientific discoveries he has never asked for a patent or sold a process. "God didn't charge for His work in making peanuts grow," he says, "so I won't charge for mine."

Among the 300 peanut products developed by Dr. Carver are cheeses, candy, instant "coffee", pickles, oils, shaving lotions, dyes, face powder, axle grease, and others that have helped to make peanuts a $60,000,000-a-year commodity.

Peanut oil is excellent for any kind of deep-fat frying since it will stand heating until very hot before it smokes and breaks down chemically. In Europe, oil made from beechnuts is substituted for olive oil, and the pressed kernels of cashew nuts also yield an oil of excellent quality.

Speaking of oil, a shampoo is made from mulsified coconut oil; and almond oil is an ingredient for a popular hand lotion. The oil is also combined with drugs.

Cracker sandwiches containing cashew butter as a filling may be purchased at many drugstore soda fountains along with nut sundaes, pecan ice cream, or sweet rolls coated with sugar and sprinkled with nuts.

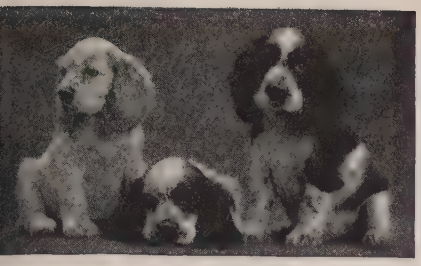
For those who shell their own nuts, a handy formula for using them in cooking has been worked out by the Bureau of Home Economics of the U. S. Department of Agriculture. Half a pound of peanuts will shell out to a cup of nut meats. Slightly less than a pound of filberts equals a level cup of filbert meats. An even pound of almonds will shell out to an even cup of nut meats, and it takes a bit more than a pound of English walnuts to crack out a measuring cup of meats. Before you can get a cup of black walnut meats you have to shell about two pounds of nuts.

Nuts having highly ornamental shells are utilized in the manufacture of costume jewelry, and certain varieties are attractive as button trimming. Brazil nuts are sometimes polished and waxed for this purpose. Nuts have also been the inspiration for songs, such as "You can't have any of my peanuts when your peanuts are gone." Nut loaf, taking the place of meat, has an important place in the diet of vegetarians.

And nuts are first-class mixers! At Hallowe'en, Thanksgiving, and Christmas gatherings nuts are quite as essential as pumpkin pie, turkey, and plum pudding. A bowl of nuts, a dish of red-cheeked apples, and a crackling open fire! What a congenial atmosphere for a friendly get-together during the long winter months!

Attracting Birds

Publication of a new series of conservation bulletins by the Bureau of Biological Survey, under the Department of the Interior, starts with the issuance of one entitled *Attracting Birds*. It is the work of W. L. McAtee and presents a wealth of practical information on the methods of attracting birds and caring for them when once attracted.



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WHAT ABOUT BULBS?

BY JOHN J. GRULLEMANS

Ever since the storm of war broke over the Netherlands, garden lovers have wondered what has happened to the bulb fields of Holland, and whether a supply of bulbs might be shipped out to the United States this year. We appealed to John J. Grullemans, noted horticulturist, of Wayside Gardens, Mentor, Ohio, for an estimate of the situation and his advice. Here is his answer.

Having been born and grown up in Holland, and my ancestors specialists in bulb growing for more than a hundred years, you can well imagine the depth of my feeling when Germany's troops found it necessary temporarily to occupy my native land. I saw visions of the devastation of our ancestral home, and the great acreage of tulips and hyacinths operated by my brothers, who are carrying on the House of Grullemans. Happily, when word finally did come from them, it brought the welcome news that none of Holland's major bulb fields had been flooded. Also came the news that the importation of bulbs from Holland this fall would be undoubtedly impossible.

As it is our custom to import these Dutch bulbs by the hundreds of thousands for America's garden lovers, you can well understand how down we felt. In view of this your editor has asked me for an estimate of the situation and for any possible helps and suggestions to disappointed bulb buyers.

First, let us consider tulips, hyacinths and crocuses. They have never been commercially grown in this country, largely because of lack of skill, adverse conditions that prevent rapid increase, and high production costs. England has grown them with some success, but they are, in the main, all of the old varieties no longer considered tip top in this country—the kind sold by the five and dime stores. So, do not expect too much from these English bulbs, some of which are being released solely for shipment to America.

As to daffodils—they have been grown in this country with decided success by skilled Hollanders, who have done a truly outstanding job in developing many of the choicest new varieties. The quality of the bulbs is in every way satisfactory. Yet in spite of the large numbers grown here, the output has never been sufficient to supply America's needs. Naturally, now that the Dutch ones are out of the picture, the supply is going to be inadequate. So, if you would avoid disappointments, I'd suggest you order the daffodils you had in mind planting this fall as early as possible.

There are also grown in this country as fine Dutch irises as can be produced anywhere. Great strides have been made in them the last few years, giving you a wide gamut of varieties and colors to choose from. The supply is ample. One of the new ones particularly recommended is Golden Lion, whose ruffled, rich yellow blooms are truly beautiful and quite in a class by themselves.

In England the Dutch Iris is proudly called "the poor man's orchid." It deserves the name. The orchid-like blooms are rich in captivating colors, ranging from pure white through golden yellow to cornflower blue, dark violet and deep purple. They are superb for cutting, stand a lot of handling and last

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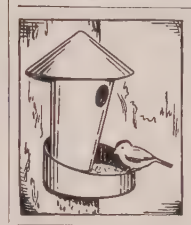

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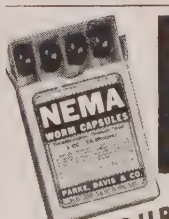

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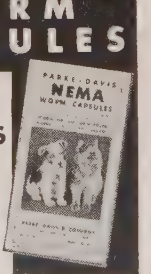

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a week or longer in water. Also, the bulbs multiply rapidly, and, when once established, the colony continues to increase, giving you more flowers each year. Few bulbs are as inexpensive and prolific. They repay you with generous beauty, asking little in return except a sunny spot, well drained, and a little winter protection in the colder parts of the country.

The Dutch Iris is a recently developed group of distinctive hybrids derived from Spanish Iris. They are hardier than the Spanish parent and can be grown anywhere outdoors. They are stronger, larger and flower with more pure and brilliant coloring, more substance and refinement than the old Spanish strain.

Dutch Iris is a bulb flower. Oriental, Japanese, and German Iris are hardy plants. All Iris varieties do better when fall-planted.

Of course, many next spring are going to miss greatly the gay colors of tulips and hyacinths in the garden, not to mention the perky delights of the valiant crocuses that come so early. But, cheer up, much of such cheerful colorfulness can be supplied by the dwarf phlox. There are now some two dozen beautiful varieties to choose from. Among them let me suggest Golden Doronicum, the deep yellow and pale Yellow Alyssum, and the rather formidably named *Dicentra spectabilis*.

As you will want to be sure of ample blooms next spring, and not have to wait until another year for the results you want, take the precaution of buying the dwarf phlox that are at least two years old, and sturdy full-rooted field-grown plants. And, another point, they must be planted this fall.

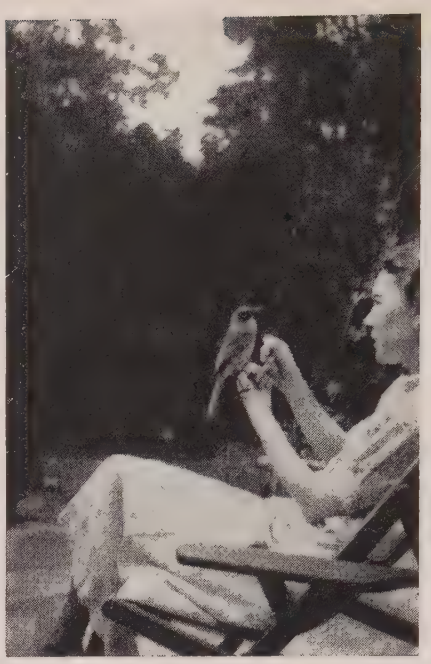
If you have been accustomed to winter-forced tulips and hyacinths for blooming on your window sill, in sun room, or greenhouse try some Amaryllis this year. These, too, have been greatly improved, both in quality and range of colors. A glorious cardinal one is the Hippeastrum.

Then there is that amazing, little, easily-grown hardy orchid, *Bletilla hyacinthina*. Planted in November it will bloom early in March, and give you six to eight dainty, cattleya-colored flowers growing on stems twelve to fifteen inches tall. They last six to eight weeks, and are as easy to grow as paper-white narcissuses, and certainly far more beautiful.

So, there is really no need to have a drab spring garden. The lack of tulips for one spring, sad as it is, will serve to force a lot of us to become acquainted with other worthy things that we will be the happier for knowing. Next year, let us hope the war will be over and Holland will again share with us its bulb bounty. We will appreciate them all the more.

Alexander Honored

To William P. Alexander, conservationist, originator of the Nature trail idea, Professor of Natural History at the Buffalo Museum of Science, goes the Cornelius Amory Pugsley award. The citation presents the medal to Dr. Alexander "for his distinguished work as a pioneer of outdoor education in state parks." Appropriately enough it was given to him during a botanical conference held at Allegany State Park. Dr. Alexander came to Buffalo in 1920 from Cornell, where he had been a member of the University department of entomology and an assistant to the late Anna Botsford Comstock.



A Friendly Jay

By Blanche Heninger

Mijay, which for obvious reasons was the name of this California jay, paid me his first visit one day when I was having lunch in the patio. Flying down from a nearby tree, he perched near my chair, took a few offerings of bread at a short distance and then ate from my hand. His appetite satisfied, he took additional pieces of bread, pushed them into the ground, covered them with dirt and carefully laid a leaf, stone or bit of wood over the spots. These markers led the way to a future meal; meals that I have often seen him take.

The other member of the family watched from the tree, refusing to come near, but now and then getting a bite brought by Mijay. When the French doors were open the bird would come in to inspect food possibilities, once departing with a piece of candy. Visitors enjoyed Mijay as much as I did because he would take food from anyone.

Nature Photo Salon

The Second Annual Boston International Salon of Nature Photography will be held in the main hall of the New England Museum of Natural History, 234 Berkeley Street, Boston, Massachusetts, from December 17, 1940 to January 31, 1941. The first salon was so outstandingly successful that the New England Museum hopes to continue it as an annual event. Full details and an entry blank may be obtained from the secretary of the Salon Committee, Miss Margaret Baker, at the address above.

When To Start

Educators seem to differ somewhat as to when science work should start in the elementary schools and how much emphasis should be placed upon it. Those who hold that it is a subject that should receive relatively little attention in the earlier grades are, however, overlooking not only a fertile field but a vital opportunity. A recent opportunity to look over some science notebooks done by fourth-graders in the Camden, New Jersey, schools brought home to us the extent of versatility and imagination of the younger students. At the same time we learned, with surprise, that Camden does not have a Nature study department or a science supervisor for the elementary schools, having done away with that post as an economy measure. These notebooks were, of course, the result of the inspiration and interest of one teacher of one class. It is, however, a short-sighted policy to sacrifice competent school leadership in this field. With grave problems confronting this country, one of the most fundamental is adequate knowledge of our natural resources to the end that they may be wisely and carefully used. It is never too early to start informing future citizens in this direction.

Bryce Canyon Geology

Bryce Canyon National Park is noted for its fantastic formations and the startling colors of the strange things Nature has carved, using erosion as her tool. Those who have visited, or who plan to visit, this Park will find specially interesting Zion-Bryce Museum Bulletin No. 4, which is a geological and geographic sketch of the Park written by Herbert E. Gregory of the U. S. Geological Survey. Copies are available from the Park Naturalist, Zion National Park, Utah, at twenty-five cents a copy.

Birds In A Cherry Tree

By Francis E. Sell

A farmer friend of mine living in this Oregon community killed twenty-nine birds in his three cherry trees, mostly grosbeaks, while the fruit was ripening. I expressed doubts about the birds' eating many cherries, suggesting that they were more interested in leaf hoppers and tent caterpillars, but he was adamant. Those birds would destroy the entire crop if something wasn't done about it!

On my own adjoining farm I have five cherry trees. Selecting three trees that appeared to be about the same size as my neighbor's I secretly checked results at the harvest. At the beginning of the experiment the trees appeared to be equal in every respect; as well-fruited and healthy, the soil the same, and, as neither orchard was irrigated, both were blessed with the same summer showers.

I never molested a bird in my orchard while the fruit was ripening. Robins and grosbeaks were in and out of the trees all day long. They took some fruit, especially the robins, but kept the insects in check. While the leaves on my trees appeared healthy, on my neighbor's they showed damage from leaf hoppers and tent caterpillars, with a decided falling of unripened fruit, due to this leaf damage.

I harvested two gallons more cherries on the same number of trees, but what is more to the point, I came from the harvest with the memory of those trees lyric with song.

Spider Collection

Some 5000 spiders were brought back from a 3000-mile field trip through Utah and Arizona by Dr. W. J. Gertsch of the American Museum of Natural History. He expects to find new species among his collection. An interesting discovery was that although the journey took the party through areas where the black widow spider is supposed to be abundant, few of these feared spiders were found. Tarantulas were present in large numbers, but Dr. Gertsch asserts that their reputations are much worse than their bites.

Teamwork

By Fred B. Morrill

In August, a couple of years ago, I was mping with a friend of mine and his son the wooded shores of a small mountain ke in the northern part of the State of Washgton. We were just enjoying a rough outing, oing a little geological investigation, boating d enough fishing to supply our larder; doing r cooking in the open, after the manner of e aborigines. Our sleeping quarters consted of two small open tents, my friend and n occupying one, and I the other.

The days were warm, but in that altitude, e nights became quite chilly toward morng. And one morning, just as the sun was uching the tree tops, I sensed the need of re covering, and after adding my raincoat the blankets, nestled down for a beauty p.

But I soon realized that in addition to the stling of the faint breeze through the tree ps and the gentle lapping of the waves on e nearby shore of the lake, there was another arby commotion, and in looking through e front opening of the tent to investigate, adily ascertained its cause.

Some half dozen red squirrels in the anches of a western spruce, not over seventye feet distant, were busily engaged in biting green cones that were eagerly seized by ner squirrels on the ground, who immedily scampered away to their storehouse.

How many comprised the ground members the team, I was unable to determine. As y were coming and going singly and in irs, I had the pleasure of watching the busy orkers until the tree was stripped of its uirrel winter fodder, when the gleaners dispeared. All who are familiar with the actities of that class of rodents will realize re was no loitering on the job.

In this section of the country there are no ch, oak, or other nut-bearing trees from ch squirrels can procure their winter supes, and conifer cones are substituted. And the instant case, they were gathered while en.

Bumblebee Pet

Before we got our screen door hung a mblebee came into our living room searchfor a home site and found one in our Vicla cabinet, writes Gladys A. Beebe of ndersport, Pennsylvania. When the door s finally up there was a crack that the quickly found and adopted as a doory. When the cabinet was moved into an oining room for the summer the bee was ch distressed, hunting madly about for it. pacify her it was moved back which ved a delight and the regular bee-line s began again. Once again the cabinet moved and this time, after a long search, bee found it in its new place. Such perrance was rewarded and the bumblebee allowed to come and go, buzzing exdly outside the door when she could not in. Finally the bee got weaker and nner, at last crawling across the floor to cabinet. Miss Beebe had, finally, to lift to the nest. The next day appeared to the end, for the bee crawled under a rning glory vine, her work done, and er emerged. Miss Beebe transferred the carefully-sealed cells from the Victrola stone pile in the hope that her pet's work l not have been in vain.

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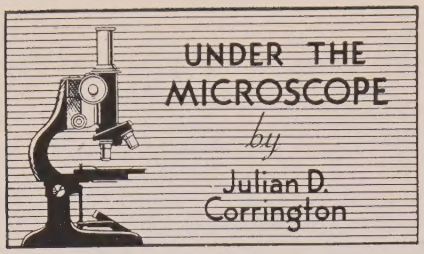
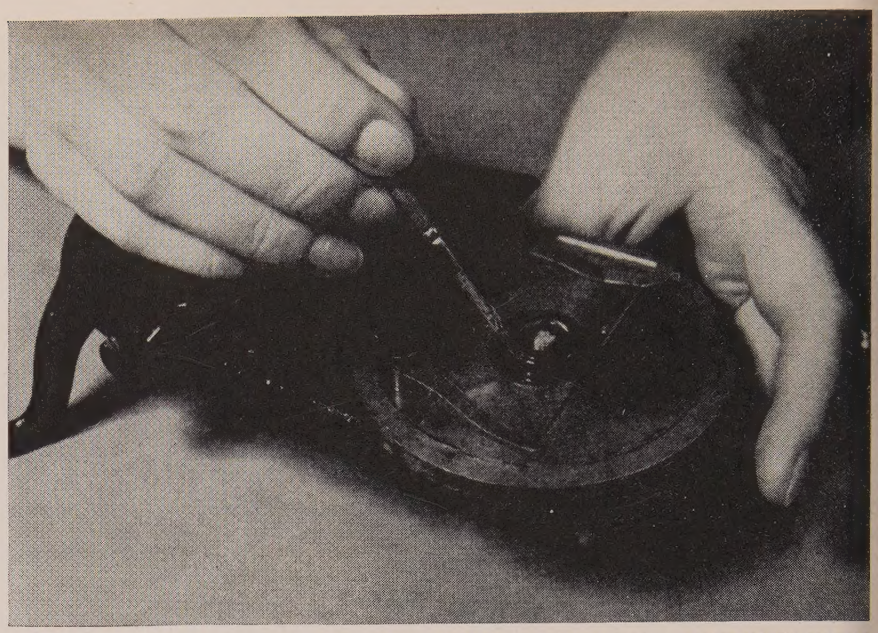


Cell Mounts of Minerals

The microscope is used for two different purposes in the study of minerals; the first being purely a hobby, because of the beauty and appeal of mineral crystals; the second being scientific or professional, with the aim of identification and analysis. The first is done largely by whole mounts, the second by thin sections; the whole mounts are opaque and observed by reflected light, the sections are translucent and used with either ordinary or polarized transmitted light. Both may be irradiated with ultraviolet light for demonstrating fluorescence. We propose to take up whole mounts this month and touch on sections next time, in connection with an article on polarized light.

Small clusters of mineral crystals are not difficult to collect if one lives in an appropriate locality, or they may be purchased at an average cost of ten cents per specimen from supply houses and dealers. In ordering, specify a small cluster of showy crystals for a microscope slide whole mount. Recommended types are: azurite, malachite, sunstone, mimetite (illustrated herewith), vanadinite, jamesonite, mordenite, opal, opalized wood, garnet, cuprite, fluorite, galena, halite and calcite. Curved wires of native silver are also most interesting.

The problem of mounting is entirely different than with the usual biological whole mount, such as a hydra or planaria, for the mineral cluster is opaque and generally rather thick. It is necessary either to use a thick slide with a central cavity, or an ordinary slide with some sort of built-up housing, in order to support and protect the specimen. There are depression and deep-well slides, but they are rather expensive, and most workers prefer the latter procedure, and build *cells* on regulation slides. The early mounters chose this word "cell"—an unfortunate choice because it may be confused with the biological meaning. They may be fashioned by cementing rings of various sorts, or by building up layers of such substances as shellac or balsam.



RINGING THE FINISHED MIMETITE SLIDE, SHOWING THE USE OF THE TURNTABLE IN THE PROCESS

The first gadget needed is a centering gauge. Take a 3″ x 5″ blank card, or piece of cardboard, and on this place a blank slide, long axis of card and slide the same. Holding the slide firmly, trace around it with pen and ink; let dry, remove slide, then with a straight-edge rule two diagonal lines connecting opposite corners of this rectangle. The point of intersection of these diagonals marks the exact center of the figure. Now whenever it is desired to mount an object, place the blank slide upon this diagram; the lines show through the glass and mark the central spot upon which to attach the specimen.

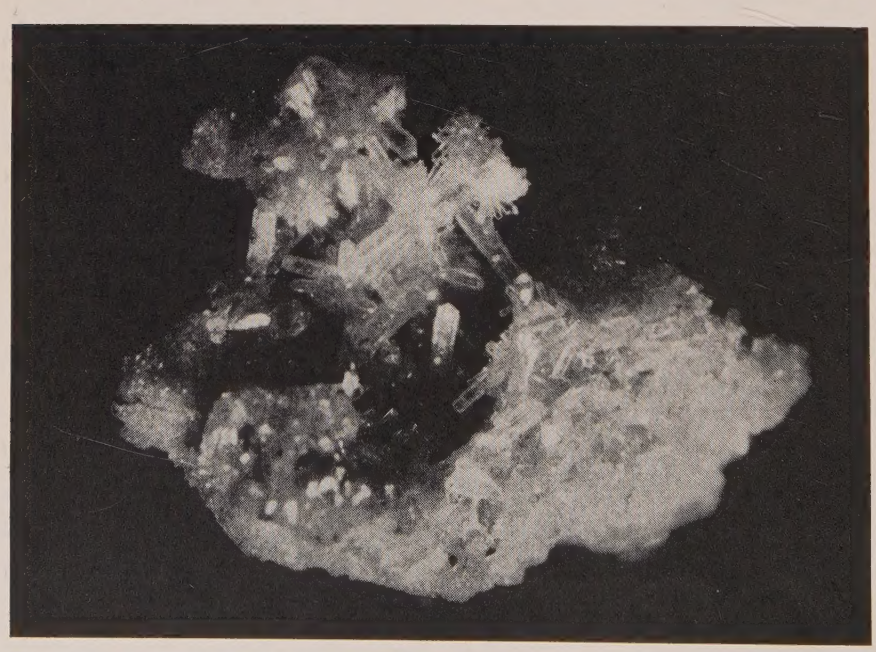
Suitable rings may be purchased or made. In the former class are bone embroidery rings, brass curtain rings, or those made of glass, hard rubber or aluminum; all averaging around ¾″ in diameter. Cells may be built up by superimposing rings cut out of old photographic films, sheets of cellulose acetate, or using cloth gummed reinforcement patches, such as are sold at stationers for repairing the holes of punched notebook paper. Cork-borers, gun-punches, or any two sizes of circular punch that differ by about ⅛″ in bore will stamp out rings from sheet material.

Having selected the ring or material you will use, next clean the slides very carefully by soaking them in a heavy emulsion of Bon Ami powder overnight. The next day, remove slides and stand them upright against a towel-covered support to drain. When dry, store or polish, using a lint-free cheesecloth. When properly cleaned for this work and free from grease, a drop of water placed on the slide will spread and run, instead of remaining as a rounded drop.

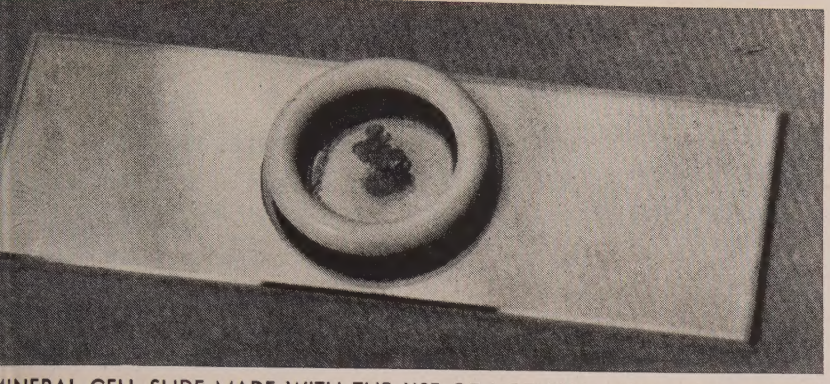
Using the centering gauge, affix a circle of black photomount paper to the slide with any of the newer forms of airplane cement; duPont's Household Cement especially recommended. The circle of black paper should be of the same diameter as the outside diameter of the ring to be used. Put away to dry for overnight, then the next day cement the ring on top of the paper and again allow overnight drying. A number of such cells may be prepared at one time, and in advance of need for them.

The mineral specimen is now cemented in the bottom center of a dry ring and put away in a dust-free place to dry completely. When ready, this slide is warmed gently over a very low flame, as an alcohol lamp, to drive off any water vapor caught from the atmosphere, and at the same time a clean, circular cover glass, of correct diameter for the ring, is flamed. Run a circle of thin balsam or cement around the top of the ring, press the cover down upon this, gently but firmly, and set the whole away to dry.

After the slide is dry it is best to size the entire exterior with a varnish, to make the cell moisture-proof, as well as to protect further the joint between cover and ring. This is done with the aid of a turntable, in



THIS IS A MAGNIFIED VIEW OF THE MIMETITE CELL MOUNT DESCRIBED IN THE ACCOMPANYING ARTICLE



HINERAL CELL SLIDE MADE WITH THE USE OF NOTHING MORE THAN A BONE EMBROIDERY RING

same manner as is now to be described spinning cells.

While not applicable to mineral mounts, is a good place to explain how low cells built up without the use of rings. A ned slide is accurately centered on the lving wheel of the turntable, which is n a spin with the left hand. This wheel, een in one of our illustrations, is a y metal disc, accurately pivoted so that ll revolve many times with a single flip ne finger, without wobbling. The right remains on the hand rest and holds a l brush of good quality, as badger hair ible, that has been dipped in one of the ishes used in microscopy. On the wheel ngraved circles of various diameters to as guides, and when the brush is low- over one of these circles and makes ct with the slide, a ring of the varnish un on the glass.

large number of slides may be so treat- a few minutes. After this first coat is usually about six hours or overnight— nd may be spun on top of the first, then d and so on to make a cell as high as ed. Finally, when material has been ed in a completed cell, the top layer rmed gently and a cover glass pressed place, then several coats are applied to ne cover, with intervals of drying be- each. Many technicians prefer to seal their slides in this manner, includ- l balsam whole mounts and sections, ge sake of the elegance of the finished rance.

ere is quite a variety of choice among shes. Black asphaltum and gold size lassics; thin balsam is very good; or- shellac is excellent. The writer pre- ne of the newer fast-drying lacquers, ses jade green and Chinese red as being ttractive in color.

this method, dry objects such as wing of butterflies are mounted in air; sands, foraminifera, radiolaria and sponge es are further examples. Delicate ob- as very minute insects, may be mount- glycerin within low cells.

urning to mineral crystals, another d dispenses with the microscope slide ouses the clusters within small boxes, ll box of the druggist being preferred. the interior of the bottom half of a ox dull black. When dry, cement to ttom center of this half a small pyra- f cork, of such size and height that the nen will be propped up half-way from ttom. When this is dry, cement the al to the top of the cork. Write the of the mineral on both bottom and f complete box, to prevent mixups, ways keep the lid on when not in use.

One of these boxes is placed on the microscope stage for observation and the crystals present gorgeous sights under low or medium magnification. This requires incident light—that which comes from above—and there are a great many arrangements for this purpose, varying all the way from ordinary student lamps to ingenious and expensive vertical illuminators that are placed around the microscope objective. A mirror fastened to the microscope, or supported beside the tube, may be used to direct light rays down upon the specimen, while a bull's-eye lens will increase the intensity of the illumination.

A Microscope Museum

A great many of our readers visit the Nation's Capital at one time or another, and one of our ardent A.S.A.M. members, Samuel Gordon, Librarian and Editorial Secretary of the *Washington Daily News,* has written us that visitors should be informed of a famous, unusual and vastly interesting exhibit in the Army Medical Museum, a collection showing the history and development of the microscope.

While we have seen this collection a number of times, we are not in possession of facts about it, and so commissioned Mr. Gordon to secure them. The Museum is located at Seventh and Independence Avenues, S.W., adjoining the Smithsonian Institution, and is open without admission charge on week days 9 to 4:30; Saturdays 9 to 1. It is the largest medical museum in the United States and has the largest medical library in the world. There are many corridors and rooms of exhibitions of the effects of disease, anatomical specimens, embryos, models, slides, photomicrographs, and historical displays of surgical and dental instruments and methods. There are more than 7000 portraits of physicians and 1200 satirical and other engravings on medical subjects.

The microscope collection is housed in corridor cases on the main floor, to the right of the entrance, and includes 375 instruments, the largest such assemblage in the world. It is under charge of the Surgeon General's office of the U. S. Army. The entire history of the microscope is unfolded in chronological order, some of the earlier instruments being replicas, but most of the exhibits are originals, among which the microscope of Dr. Walter Reed always attracts much attention.

Here one may see replicas of the instruments of Leeuwenhoek and Hooke, the wooden stands of Nuremberg, the ornate designs of the late eighteenth century. Numerous early models appear ingenious, but were "quite useless" according to the label cards.

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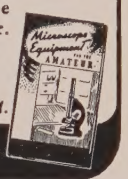
At right is the Bausch & Lomb DDE research microscope. With usual lens equipment it sells for $774.50. It is doing useful work in many of the world's most famous hospitals and research laboratories. At left is the Model R, a microscope built for amateur use. It was designed by the same scientists responsible for the DDE, is built in the same factory, to Bausch & Lomb precision standards. Complete with case and 455-page book written by Dr. J. D. Corrington, it sells for $21.

FREE BOOKLET tells how to go about microscopy as a hobby, describes Bausch & Lomb microscope equipment for the amateur. Write for your copy.



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Some are shining monsters of metal two feet in height, others no more than three inches. The exhibit includes both simple and compound microscopes, as well as binocular, student and even miniature types. The progress in design of such parts as eyepieces, objectives and condensers is also shown, while the display of photomicrographs is a splendid addition.

By all means take advantage of any opportunity to browse through this marvelous collection.

Trade Notes

Offering of the month is a valuable piece of literature for all microfans, a twelve-page reprint from *The Scientific Monthly* of an article by Eisenhart and Melson, *Development and Manufacture of Optical Glass in America,* fully illustrated. This pamphlet has been made available for our readers through the courtesy of the Bausch & Lomb Optical Company, of which the authors are officers. Properties of old and new optical glasses are given, along with an explanation of melting, annealing and other manufacturing operations. Send a 3c stamp to Julian D. Corrington, NATURE MAGAZINE, 1214 Sixteenth St., N.W., Washington, D. C., for a copy of this booklet.

Technicians in many fields have long sought the perfect medium for writing on glass. In microscopy alone there has been great demand for something more permanent than a paper label on slides, less troublesome than etching solutions, easier to use and more legible than a diamond stylus. So it was with some scepticism that we requested a set of the new *Gold Seal Permanent Laboratory Inks* for testing, in order to report the results to our readers. The directions appeared too simple to yield the results claimed. But our doubts vanished at once when we tried out these inks. They are all that their producers claim. You write directly on glass with an ordinary pen and the ink flows exactly as easily as in writing a letter on paper. As soon as dry, the writing is permanent, and resistant to acids, alkalis, solvents and heat. The inks are neither acid, corrosive, injurious or inflammable themselves. There are four colors, white, black, red and blue, and they may be used on all form of laboratory glassware or porcelain. Each color is priced at 50c per one-ounce bottle, or a kit of the four colors for $2.00. We highly recommend this splendid new product. Full directions for use accompany each shipment. Clay-Adams Co., Inc., 44 E. 23rd St., New York City.

After years of preparation, a monumental new work in three volumes has appeared, *Comparative Psychology* by Warden, Jenkins and Warner. Vol.I, Principles and Methods, deals with the development of modern comparative psychology, including many portraits of famous workers in this field, the biological foundations, classification and analysis of behavior, and hosts of methods of testing reception and reaction. Vol. II, Plants and Invertebrates, covers all groups of organisms up to vertebrates, even including isolated cells and tissue cultures. Vol. III, Vertebrates, takes up all classes in this phylum, stressing the mammals and, among them, the primates. There are more than 2,000 pages and nearly 400 illustrations in the set, but we were especially impressed by the enormous and very skilfully worked out bibliography—more than 8000 references being included. No one having an interest in behavioristic or experimental biology can afford to be without this classical work. The style is exceptionally good throughout, making these volumes very readable. Prices are: Vol. I, $4.50; II, $6.00; III, $4.50; or the complete set of three for $12.50. The Ronald Press Company, 15 East 26th St., New York City.

Dr. Libbie Hyman of the American Museum of Natural History, and previously a well-known professor of zoology at the University of Chicago, has completed the first volume of her projected series on invertebrate zoology, a subject with which she is eminently qualified to deal. *The Invertebrates, Protozoa Through Ctenophora,* is the title of this large work of 708 pages and more than a thousand illustrations, mostly originals by the author.

This is a most important advanced work, covering in comprehensive fashion all of our modern knowledge on the morphology, physiology, embryology and biology of each invertebrate group, with briefer treatment accorded classification, phylogeny and paleontology. The type plan has been rejected in favor of a full discussion of a great many forms, and the author has restudied existing concepts and has overhauled them in no uncertain fashion, often rejecting time-honored ideas when she finds them unsupported in fact. No teacher or student of the invertebrata can afford to miss this splendid work; the bibliographies and illustrations alone are of great value. McGraw-Hill Book Co., Inc., 330 W. 42d St., New York. $7.00.

Here is one for the geologists—Frank F. Grout's sixth and completely revised edition of the well-known *Handbook of Rocks* by the late James Furman Kemp, for many years professor of geology at Columbia University. Some knowledge of geology is presumed on the part of the student or reader and the approach is scholarly rather than elementary, but with these prerequisites in mind one will find a full exposition in excellent style of the properties, composition and formation of all kinds of rocks, together with their varieties, relationships, alterations, distribution and uses. There are 300 pages and 96 figures, both drawings and photographs. D. Van Nostrand Co., Inc., 250 Fourth Ave., New York. $3.00.

Teachers and hobbyists alike will find a great many valuable suggestions in *Adventures in Biology,* the second edition of which has just been published by the New York Association of Biology Teachers. This is a manual of projects; how to make, grow, observe, experiment with, and demonstrate all sorts of materials and setups in biology. There are 265 separate projects, a section to help the student find the sort of project he would most like to do, and a good bibliography of references. We liked this little paper-bound book of 110 pages so well that we plan to use it ourself as a teaching aid. Order from Mrs. Estella R. Steiner, Grover Cleveland High School, 2127 Himrod St., Ridgewood, Queens, New York, and mention NATURE MAGAZINE. Prices, single copi 50 cents; 10 or more copies to the same a dress, 20% discount.

A.S.A.M. News

Our Society continues to show a healt growth and has now passed the 600 mar Conditions abroad effected a sharp curta ment in enrollment of British microscopis which had just gotten nicely under way, b our Canadian friends continue to affilia along with new members from Latin Ameri and U. S. possessions. Every state in t Union is now represented by at least o member with the exception of Vermo Mississippi, North Dakota, Montana, W oming and Nevada.

The elite as well as the rank and file microscopy find our accomplishments worti of their support. During the past month v have signed up Dr. Fred W. Gray Philippi, W. Va., whose botanical work well known, and Frank J. Myers, Resear Associate on Rotatoria, American Museum Natural History, Research Associate Microscopy, Academy of Natural Scienc of Philadelphia, Fellow of the Royal Micr scopical Society of London, Honorary Mer ber of the Quekett Microscopical Club London, and member of the Americ Microscopical Society and of the New Yo Microscopical Society.

The Indianapolis group has completed o ganization and has been granted their chart as the Eli Lilly Chapter, A.S.A.M. Fred Miller, 940 N. Bancroft St., the organizer, the first president, while N. Merrill Unde wood, 1215 Markwood Ave., is secretar Microfans in the Indianapolis vicinity shou communicate with Mr. Underwood.

D. L. Bishop, of Fairview Village, Ohi sends in this tip: *Kodachrome Exposu With the Microscope,* by George H. Nee ham, p. 397 in the August issue of *Came Craft.*

Brooklyn, with the largest enrollment any city, is progressing with plans for bo high school and adult Chapters; any inte ested reader should communicate with Cor lius Denslow, Supervisor of Nature Projec at the Brooklyn Children's Museum.

Miami Edison High School plans a Cha ter with the opening of the fall school ter If you are a teacher or a student in eith a high school or a college, how about putti in a Chapter of the A.S.A.M. this fal Those already organized report remarkab progress and activity.

Bulletin #3 has caused a great deal favorable comment and criticism, and see to have met with an excellent reception. number of manuscripts are already in f the fourth issue, and we have the ea promise of certain comprehensive and sch arly articles that will be certain to create high standard of excellence. We hope carry in each issue something of value a interest to every class of reader, from t high school freshman to the advanced search specialist.